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NEWS 16	FEB 22	Status of current WO (PCT) information on STN
NEWS 17	FEB 22	The IPC thesaurus added to additional patent databases on STN
NEWS 18	FEB 22	Updates in EPFULL; IPC 8 enhancements added
NEWS 19	FEB 27	New STN AnaVist pricing effective March 1, 2006
NEWS 20	FEB 28	MEDLINE/LMEDLINE reload improves functionality
NEWS 21	FEB 28	TOXCENTER reloaded with enhancements
NEWS 22	FEB 28	REGISTRY/ZREGISTRY enhanced with more experimental spectral property data
NEWS 23	MAR 01	INSPEC reloaded and enhanced
NEWS 24	MAR 03	Updates in PATDPA; addition of IPC 8 data without attributes
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=> s (hydrogen gas) and algae
L1 75 (HYDROGEN GAS) AND ALGAE

=>

=> s l1 and (sulfate permease)
L2 2 L1 AND (SULFATE PERMEASE)

=> d l2 ibib abs total

L2 ANSWER 1 OF 2 CAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 2003:634036 CAPLUS
DOCUMENT NUMBER: 139:178821
TITLE: Modulation of **sulfate permease** for photosynthetic hydrogen production
INVENTOR(S): Melis, Anastasios; Wintz, Hsu-ching Chen
PATENT ASSIGNEE(S): The Regents of the University of California, USA
SOURCE: PCT Int. Appl., 80 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2003067213	A2	20030814	WO 2003-US2198	20030124
WO 2003067213	A3	20040122		
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
US 2003162273	A1	20030828	US 2003-350298	20030122
CA 2472765	AA	20030814	CA 2003-2472765	20030124
EP 1472338	A2	20041103	EP 2003-708872	20030124
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
JP 2005516629	T2	20050609	JP 2003-566515	20030124
PRIORITY APPLN. INFO.:			US 2002-354760P P	20020204
			US 2002-377902P P	20020502
			US 2003-350298 A	20030122
			WO 2003-US2198 W	20030124

AB Sustained hydrogen production is obtained by the culturing of a genetically-modified **algae**, where the ability of the chloroplasts to intake sulfate is reduced or eliminated compared to wild-type **algae**. The alga is cultured in a sealed environment in a liquid or solid medium that contains sulfur, and hydrogen is generated continuously. Alternatively, the **algae** may be cultured in the presence of bacteria that also produce **hydrogen gas**. The hydrogen produced can be collected and used as a clean energy source. Thus the sulP gene of Chlamydomonas reinhardtii encoding a **sulfate permease** was isolated and characterized. This information was then used to construct a plasmid bearing an antisense fragment of the sulP gene. The antisense plasmid vector was then employed to obtain sulP knockout mutants of Chlamydomonas reinhardtii.

L2 ANSWER 2 OF 2 BIOTECHDS COPYRIGHT 2006 THE THOMSON CORP. on STN
ACCESSION NUMBER: 2005-24395 BIOTECHDS
TITLE: Generating **hydrogen gas** comprises culturing **algae** (and optionally also anaerobic bacteria) under illuminated conditions in media comprising sulfur, where the **algae** have reduced **sulfate permease** activity;
hydrogen gas generation via genetically modified green alga
AUTHOR: MELIS A; WINTZ H C
PATENT ASSIGNEE: UNIV CALIFORNIA
PATENT INFO: WO 2005072254 11 Aug 2005
APPLICATION INFO: WO 2005-US1937 21 Jan 2005
PRIORITY INFO: US 2004-762769 21 Jan 2004; US 2004-762769 21 Jan 2004
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: WPI: 2005-564411 [57]
AN 2005-24395 BIOTECHDS
AB DERWENT ABSTRACT:
NOVELTY - Methods for generating **hydrogen gas** using **algae** with reduced **sulfate permease** activity, are new. In some of the methods anaerobic bacteria are also used to produce more hydrogen.
DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for: (1) generating (M1) **hydrogen gas** comprising: (a) culturing **algae** under illumination in a media comprising sulfur, where the **algae** have reduced **sulfate permease** expression relative to wild-type; (b) sealing the **algae** culture from atmospheric oxygen; and (c) collecting **hydrogen gas** evolved; (2) generating (M2)

hydrogen gas comprising: (a) subjecting a biomass comprising an **algae** to sunlight in a sulfur-containing media comprising carbon dioxide and inorganic nutrients under conditions that cause the **algae** to undergo oxygenic photosynthesis and to generate **hydrogen gas**; and (b) subjecting an anaerobic photosynthetic bacterium in the media to sunlight under conditions so as to generate hydrogen from a nitrogenase/hydrogenase enzymatic system in the media; (3) generating (M3) **hydrogen gas**, comprising: (a) providing in an aqueous media a genetically modified strain of Chlamydomonas reinhardtii; (b) providing a strain of Rhodobacter sphaeroides photosynthetic bacteria; (c) exposing the media to sunlight under conditions to allow for the generation of biomass and hydrogen; (d) subjecting an anaerobic photosynthetic bacterium in the media to sunlight so as to generate hydrogen from a nitrogenase/hydrogenase enzymatic system in the media; (e) providing a strain of Clostridium in the media; and (f) inducing fermentation of the biomass in the media via Clostridium sp.; (4) generating (M4) hydrogen comprising culturing a combination of sulP1 strain of Chlamydomonas reinhardtii and Rhodobacter sphaeroides with Clostridium sp.; (5) generating (M5) **hydrogen gas**, comprising: (a) providing in an aqueous media a sulP1 strain of Chlamydomonas reinhardtii and Rhodobacter sphaeroides bacteria; and (b) exposing the media to sunlight under conditions that allow the generation of hydrogen; (6) an isolated nucleotide sequence selected from SEQ ID NOs 2-6 (3873, 1984, 1863, 2253, and 1853 bp) and a sequence which hybridizes to any one of them; (7) an isolated amino acid sequence selected from SEQ ID NO:1 (411 amino acids) and a sequence with 90% or more sequence homology to SEQ ID NO:1; (8) a genetically modified **algae** in which the sulfate uptake pathway is downregulated to 50% or less relative to wild-type **algae**; (9) a composition comprising water, **algae** growth nutrients, and the **algae** of (8); (10) an assay for detecting low levels of sulfur uptake in a sample of genetically modified green **algae** comprising: (a) culturing a genetically modified sample of green **algae** in TAP media in lighted, anaerobic conditions; (b) transferring an aliquot of the sample into a media comprising sulfur; (c) culturing the aliquot in lighted conditions; and (d) detecting the level of aryl-sulfatase (ARS) activity in the aliquot, where an elevated level of ARS activity is a positive indicator that the modified **algae** is deficient in sulfur uptake; (11) an isolated antisense oligonucleotide comprising a nucleotide sequence complementary to (codons 118-412 of) SEQ ID NO:2; (12) an expression vector comprising an antisense sequence complementary to codons 118-412 of SEQ ID NO:2; and (13) a composition comprising a sulP strain of Chlamydomonas reinhardtii and a Rhodobacter sphaeroides bacterium that is anaerobic and photosynthetic.

BIOTECHNOLOGY - Preferred Method: In (M1) the **algae** is a green **algae** and comprises a genome which is genetically engineered to reduce **sulfate permease** expression. The **algae** is a unicellular, photosynthetic, anoxygenic **algae** . The **algae** is chosen from Rhodobacter sphaeroides and genetically modified Chlamydomonas reinhardtii. The **algae** is Rhodobacter sphaeroides an anoxygenic photosynthesis bacterium of lineage Proteobacteria, alphaproteobacteria, Rhodobacterales, Rhodobacteraceae. The **algae** is an isolated strain with a level of **sulfate permease** of 50% or less of that of wild-type. The **algae** is genetically modified by insertion of an antisense sequence to CrcpSulP. The **algae** is modified by insertion of a sense or antisense strand of CrcpSulP, ablation of CrcpSulP, and targeted gene deletion of CrcpSulP. The antisense sequence hybridizes to a portion of SEQ ID NO:2. (M5) preferably further comprises providing Clostridium in the media.(M2) preferably further comprises inducing fermentation of the biomass of Chlamydomonas/Rhodobacter via Clostridium sp. Preferred Composition: The composition comprising a sulP1 strain of Chlamydomonas reinhardtii and a Rhodobacter sphaeroides bacterium further comprises a Clostridium sp having the lineage Bacteria, Firmicutes, Clostridia, Clostridales, Clostridiaceae.

USE - The methods are useful for generating **hydrogen gas** (claimed) for use as a fuel.

ADVANTAGE - **Algae** produce **hydrogen gas** in the absence of sulfur in their growth media, but removing sulfur from the growth media is problematic. The methods allow the production of

hydrogen using **algae** without requiring the removal of sulfur from the media, and alleviate the need to allow the cells to go back to normal photosynthesis to recover metabolites such as starch and protein, allowing sustained and continuous hydrogen production. The methods including the use of green **algae** and photosynthetic purple bacteria are efficient in using a broad portion of the solar spectrum.(94 pages)

```
=> dup rem l1
PROCESSING COMPLETED FOR L1
L3            53 DUP REM L1 (22 DUPLICATES REMOVED)
                 ANSWERS '1-2' FROM FILE MEDLINE
                 ANSWER '3' FROM FILE AGRICOLA
                 ANSWERS '4-16' FROM FILE JICST-EPLUS
                 ANSWER '17' FROM FILE CABA
                 ANSWERS '18-30' FROM FILE BIOSIS
                 ANSWERS '31-40' FROM FILE CAPLUS
                 ANSWERS '41-42' FROM FILE LIFESCI
                 ANSWERS '43-45' FROM FILE BIOTECHDS
                 ANSWERS '46-49' FROM FILE BIOENG
                 ANSWERS '50-53' FROM FILE SCISEARCH

=>

=> d his

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     FILE 'MEDLINE, AGRICOLA, DRUGU, JICST-EPLUS, CABA, BIOTECHNO, BIOSIS,
     CAPLUS, LIFESCI, BIOTECHDS, EMBASE, BIOENG, SCISEARCH' ENTERED AT
     11:17:26 ON 09 MAR 2006
L1             75 S (HYDROGEN GAS) AND ALGAE
L2              2 S L1 AND (SULFATE PERMEASE)
L3             53 DUP REM L1 (22 DUPLICATES REMOVED)

=> d l3 ibib abs total

L3   ANSWER 1 OF 53     MEDLINE on STN                    DUPLICATE 6
ACCESSION NUMBER:    2002308490     MEDLINE
DOCUMENT NUMBER:     PubMed ID: 12049920
TITLE:               Hydrogenases in green algae: do they save the
                     algae's life and solve our energy problems?.
AUTHOR:              Happe Thomas; Hemschemeier Anja; Winkler Martin; Kaminski
                     Annette
CORPORATE SOURCE:    Botanisches Institut, Abt. Molekulare Biochemie,
                     Universitat Bonn, Karlrobert-Kreiten-Strasse 13, 53115
                     Bonn, Germany.. t.happe@uni-bonn.de
SOURCE:              Trends in plant science, (2002 Jun) Vol. 7, No. 6, pp.
                     246-50.
                     Journal code: 9890299. ISSN: 1360-1385.
PUB. COUNTRY:        England: United Kingdom
DOCUMENT TYPE:       Journal; Article; (JOURNAL ARTICLE)
LANGUAGE:            English
FILE SEGMENT:        Priority Journals
ENTRY MONTH:         200207
ENTRY DATE:          Entered STN: 20020611
                     Last Updated on STN: 20020731
                     Entered Medline: 20020730
AB   Green algae are the only known eukaryotes with both oxygenic
     photosynthesis and a hydrogen metabolism.  Recent physiological and
     genetic discoveries indicate a close connection between these metabolic
     pathways.  The anaerobically inducible hydA genes of algae
     encode a special type of highly active [Fe]-hydrogenase.  Electrons from
     reducing equivalents generated during fermentation enter the
     photosynthetic electron transport chain via the plastoquinone pool.  They
     are transferred to the hydrogenase by photosystem I and ferredoxin.  Thus,
     the [Fe]-hydrogenase is an electron 'valve' that enables the algae
     to survive under anaerobic conditions.  During sulfur deprivation,
     illuminated algal cultures evolve large quantities of hydrogen
```

gas, and this promises to be an alternative future energy source.

L3 ANSWER 2 OF 53 MEDLINE on STN DUPLICATE 7
ACCESSION NUMBER: 2001653423 MEDLINE
DOCUMENT NUMBER: PubMed ID: 11706159
TITLE: Hydrogen production. Green **algae** as a source of energy.
AUTHOR: Melis A; Happe T
CORPORATE SOURCE: Department of Plant and Microbial Biology, 111 Koshland Hall, University of California, Berkeley, CA 94720-3102, USA.. melis@nature.berkeley.edu
SOURCE: Plant physiology, (2001 Nov) Vol. 127, No. 3, pp. 740-8. Ref: 45
Journal code: 0401224. ISSN: 0032-0889.
PUB. COUNTRY: United States
DOCUMENT TYPE: Journal; Article; (JOURNAL ARTICLE)
General Review; (REVIEW)
LANGUAGE: English
FILE SEGMENT: Priority Journals
ENTRY MONTH: 200202
ENTRY DATE: Entered STN: 20011114
Last Updated on STN: 20020215
Entered Medline: 20020214

AB **Hydrogen gas** is thought to be the ideal fuel for a world in which air pollution has been alleviated, global warming has been arrested, and the environment has been protected in an economically sustainable manner. Hydrogen and electricity could team to provide attractive options in transportation and power generation. Interconversion between these two forms of energy suggests on-site utilization of hydrogen to generate electricity, with the electrical power grid serving in energy transportation, distribution utilization, and hydrogen regeneration as needed. A challenging problem in establishing H(2) as a source of energy for the future is the renewable and environmentally friendly generation of large quantities of H(2) gas. Thus, processes that are presently conceptual in nature, or at a developmental stage in the laboratory, need to be encouraged, tested for feasibility, and otherwise applied toward commercialization.

L3 ANSWER 3 OF 53 AGRICOLA Compiled and distributed by the National Agricultural Library of the Department of Agriculture of the United States of America. It contains copyrighted materials. All rights reserved. (2006) on STN
ACCESSION NUMBER: 81:31451 AGRICOLA
DOCUMENT NUMBER: IND81025599
TITLE: An outdoor biophotolytic system using the cyanobacterium Anabaena cylindrica B629 **Hydrogen gas, algae.**
AUTHOR(S): Smith, G.D.; Lambert, G.R.
AVAILABILITY: DNAL (381 J8224)
SOURCE: Biotechnology and bioengineering., Jan 1981 Vol. 23, No. 1. p. 213-220
Publisher: New York, John Wiley & Sons.
ISSN: 0006-3592
NOTE: 18 ref.
DOCUMENT TYPE: Article
FILE SEGMENT: U.S. Imprints not USDA, Experiment or Extension
LANGUAGE: English

L3 ANSWER 4 OF 53 JICST-EPlus COPYRIGHT 2006 JST on STN DUPLICATE 3
ACCESSION NUMBER: 1040742483 JICST-EPlus
TITLE: Microbial Preparation of Gold Nanoparticles by Anaerobic Bacterium
AUTHOR: KONISHI Y; NOMURA T; TSUKIYAMA T; SAITOH N
CORPORATE SOURCE: Osaka Prefecture Univ., Osaka, Jpn
SOURCE: Trans Mater Res Soc Jpn, (2004) vol. 29, no. 5, pp. 2341-2343. Journal Code: L4468A (Fig. 4, Ref. 4)
ISSN: 1382-3469
PUB. COUNTRY: Japan
DOCUMENT TYPE: Conference; Article
LANGUAGE: English

STATUS: New

AB A preparation method is tried for obtaining nano-gold particles from an aqueous solution of HAuCl4 utilizing iron reducing bacteria of Shewanella **algae** and **hydrogen gas** as an electron donor
The aqueous solution of HAuCl4 of the concentration of 0.8 to 2.4 mol/m3 is added with the Shewanella **algae** to the concentration of 4x1015cell/m3, and the solution is kept at 30 .DEG.C. while bubbling of the mixture of hydrogen and carbon dioxide is continued. Electron microscopic observation confirms the formation of nano-particles of gold of the diameters ranging from 10 to 20 nm after keeping the aqueous solution of HAuCl4 of the concentration of 1mol/m3 for 60 min at 30 .DEG.C..

L3 ANSWER 5 OF 53 JICST-EPlus COPYRIGHT 2006 JST on STN DUPLICATE 10
ACCESSION NUMBER: 880204570 JICST-EPlus
TITLE: Photoproduction of hydrogen by adapted cells of Chlorella pyrenoidosa.
AUTHOR: KOJIMA E; YAMAGUCHI Y
CORPORATE SOURCE: Univ. Tsukuba, Ibaraki, JPN
SOURCE: J Ferment Technol, (1988) vol. 66, no. 1, pp. 19-25. Journal Code: G0535B (Fig. 10, Ref. 17)
ISSN: 0385-6380
PUB. COUNTRY: Japan
DOCUMENT TYPE: Journal; Article
LANGUAGE: English
STATUS: New

AB Photoproduction of **hydrogen gas** by the green alga Chlorella pyrenoidosa was studied in a large scale culture of 2l. Hydrogen was produced by adding sodium hydrosulfite directly to an algal suspension after anaerobiosis in darkness for activation of hydrogenase. The hydrogen production rate showed a characteristic course of an initial burst of gas the steady production, and this course appeared most clearly at cell concentrations around 0.6-0.7kg/m3. In the final third phase, the hydrogen production rate gradually decreased until evolution ceased. The steady hydrogen evolution was inhibited 75% by a herbicide, DCMU, which blocks electron flow through photosystem II, indicating that the electron donor for hydrogen production was mainly water. The average light intensity within the culture vessel was measured with a diffusing sphere photoprobe. The rate of hydrogen evolution increased hyperbolically with the average light intensity. The duration of hydrogen photoproduction was shorter a higher light intensity due to the inhibition of hydrogenase by concomitantly released oxygen. The duration was shorter also at higher concentrations of algal suspension. It was found that the optimum concentration of **algae**, about 0.7kg/m3 in this system, must be selected to maximize the yield of hydrogen.(author abst.)

L3 ANSWER 6 OF 53 JICST-EPlus COPYRIGHT 2006 JST on STN
ACCESSION NUMBER: 990794410 JICST-EPlus
TITLE: Photobiological Hydrogen Production.
AUTHOR: ASADA Y; MIYAKE J
CORPORATE SOURCE: Aist, Miti, Ibaraki, Jpn
SOURCE: J Biosci Bioeng, (1999) vol. 88, no. 1, pp. 1-6. Journal Code: G0535B (Fig. 3, Ref. 67)
ISSN: 1389-1723
PUB. COUNTRY: Japan
DOCUMENT TYPE: Journal; General Review
LANGUAGE: English
STATUS: New

AB The principles and recent progress in the research and development of photobiological hydrogen production are reviewed. Cyanobacteria produce **hydrogen gas** using nitrogenase and/or hydrogenase.
Hydrogen production mediated by native hydrogenases in cyanobacteria occurs under in the dark under anaerobic conditions by degradation of intracellular glycogen. In vitro and in vivo coupling of the cyanobacterial photosynthetic system with a clostridial hydrogenase via cyanobacterial ferredoxin was demonstrated in the presence of light. Genetic transformation of Synechococcus PCC7942 with the hydrogenase gene from Clostridium pasteurianum was successful; the active enzyme was expressed in PCC7942. The strong hydrogen producers among photosynthetic bacteria were isolated and characterized. Coculture of Rhodobacter and

Clostriudium was applied for hydrogen production from glucose. A mutant strain of Rhodobacter sphaeroides RV whose light-harvesting proteins were a!tered was obtained by UV irradiation. Hydrogen productivity by the mutant was improved when irradiated with monochromatic light of some wavelengths. The development of photobioreactors for hydrogen production is also reviewed. (author abst.)

L3 ANSWER 7 OF 53 JICST-EPlus COPYRIGHT 2006 JST on STN
ACCESSION NUMBER: 980219717 JICST-EPlus
TITLE: Synthetic research on improvement strategy of biological production systems by **hydrogen gas.**
Fiscal 1995-1996.(Ministry of Education S).
AUTHOR: OMIYA KUNIO; WATANABE IWAO
CORPORATE SOURCE: Mie Univ., Fac. of Bioresour.
SOURCE: Suiso Gasu no Seibutsu Seisankei no Kairyo Senryaku no Sogoteki Kenkyu. Heisei 7-8 Nendo. No.07306016, (1997) pp. 208P. Journal Code: N19980321
PUB. COUNTRY: Japan
DOCUMENT TYPE: Journal; Article
LANGUAGE: Japanese
STATUS: New

L3 ANSWER 8 OF 53 JICST-EPlus COPYRIGHT 2006 JST on STN
ACCESSION NUMBER: 970226254 JICST-EPlus
TITLE: Fermentative Metabolism to Produce **Hydrogen Gas** and Organic Compounds in a Cyanobacterium, Spirulina platensis.
AUTHOR: AOYAMA K; UEMURA I
MIYAKE J; ASADA Y
CORPORATE SOURCE: Tokyo Gas Co. Ltd., Yokohama, JPN
AIST/MITI, Ibaraki, JPN
SOURCE: J Ferment Bioeng, (1997) vol. 83, no. 1, pp. 17-20. Journal Code: G0535B (Fig. 5, Tbl. 2, Ref. 23)
CODEN: JFBIEX; ISSN: 0922-338X
PUB. COUNTRY: Japan
DOCUMENT TYPE: Journal; Article
LANGUAGE: English
STATUS: New
AB The non nitrogen-fixing and filamentous cyanobacterium Spirulina platensis NIES-46 produced **hydrogen gas**, ethanol, and low molecular organic acids auto-fermentatively under dark and anaerobic conditions. The fermentative productivity was enhanced by incubating the cyanobacterium under nitrogen-starved conditions. Cell-free extracts of the cyanobacterium catalyzed hydrogen production by the addition of acetyl-coenzyme A and pyruvate. Pyruvate-degrading and acetaldehyde dehydrogenase activities were observed in the cell-free extracts. These results suggest that the fermentation was dependent on the anaerobic degradation of endogenous glycogen via pyruvate. (author abst.)

L3 ANSWER 9 OF 53 JICST-EPlus COPYRIGHT 2006 JST on STN
ACCESSION NUMBER: 960132081 JICST-EPlus
TITLE: Improvement of Azolla-Anabaena symbiosis and its uses as water decontaminat and energy source.
AUTHOR: WATANABE IWAO
SHIOMI NOBUYUKI; KITO SHUNJI
CORPORATE SOURCE: Mie Univ., Fac. of Bioresour.
Univ. of Osaka Prefect.
SOURCE: Nissan Kagaku Shinko Zaidan Kenkyu Hokokusho (Research Projects in Review, Nissan Science Foundation), (1995) vol. 18(1995), pp. 13-16. Journal Code: X0726A (Ref. 7)
ISSN: 0911-4572
PUB. COUNTRY: Japan
DOCUMENT TYPE: Journal; Article
LANGUAGE: Japanese
STATUS: New
AB Azolla in symbiosis with nitrogen fixing cyanobacterial has been used as greenmanure. In Japan, the use as water decontaminant has been tried with local Azolla strains. The authors aimed at expanding its potential use by introducing many Azolla strains from International Rice Research Institute. In Mie University, about 30 introduced strains were grown in

water and soil cultures to screen best growing strains. Hybrids of A.microphylla and A.filiculoides recorded superior performance. The relationship between growth and air temperature was obtained. In the University Osaka Prefecture, strains were grown in secondary wastewater, and indigenous strains recorded best, but some introduced strains of A.microphylla, A.mexicana, and A.caroliniana(CA-ME-MI) behaved equally well. N, P, and K uptake from wastewater from some of introduced strains was recorded comprable to the previous data, using local strains. The telerance to Ga, rare resources for semiconductor tips, and its uptake by Azoola were studied. The growth was inhibited 30-60% at 26ppm. A.filiculoides, and A.microphylla showed more tolerance and Ga accumulation than other species. Symbiotic cyanobacteria did not accumulate Ga. The growth at 20mM ammonium was examined to see Azolla tolerant of high ammonium. A.pinnata var. pinnata strains were most tolerant, followed by some CA-ME-MI strains. Azolla evolves **hydrogen gas** in the absence of dinitrogen gas owing to symbiotic cyanobacteria's nitrogenase. The ratio of **hydrogen gas** evolved to acetylene reduction(nitrogenase activity) was 0.4 at the maximum. This ratio increased as nitrogenase activity of Azolla increased. (author abst.)

L3 ANSWER 10 OF 53 JICST-EPlus COPYRIGHT 2006 JST on STN
ACCESSION NUMBER: 930896844 JICST-EPlus
TITLE: Biological production of **hydrogen gas**. **Hydrogen gas** generation by nitrogen-fixing enzyme.
AUTHOR: WATANABE IWAO
CORPORATE SOURCE: Miedai Seibutsushigen
SOURCE: Baiosaiensu to Indasutori (Bioscience & Industry), (1993) vol. 51, no. 10, pp. 823-825. Journal Code: G0089A (Tbl. 1, Ref. 5)
CODEN: BIDSE6; ISSN: 0914-8981
PUB. COUNTRY: Japan
DOCUMENT TYPE: Journal; Commentary
LANGUAGE: Japanese
STATUS: New

L3 ANSWER 11 OF 53 JICST-EPlus COPYRIGHT 2006 JST on STN
ACCESSION NUMBER: 910781823 JICST-EPlus
TITLE: Extremely Low D/H Ratios of Photoproduced Hydrogen by Cyanobacteria.
AUTHOR: LUO Y-H; STERNBERG L; SUDA S; KUMAZAWA S; MITSUI A
CORPORATE SOURCE: Univ. Miami, Florida, USA
SOURCE: Plant Cell Physiol, (1991) vol. 32, no. 6, pp. 897-900. Journal Code: F0964A (Fig. 2, Ref. 24)
CODEN: PCPHA5; ISSN: 0032-0781
PUB. COUNTRY: Japan
DOCUMENT TYPE: Journal; Article
LANGUAGE: English
STATUS: New
AB Cyanobacteria, having primary photosynthetic reactions similar to higher plants, are capable of producing large quantities of molecular hydrogen by nitrogenase and/or hydrogenase delivering electrons to hydrogen ions via ferredoxin or oxidation of NADPH. We measured the deuterium/hydrogen (D/H) ratios of the **hydrogen gas** photoproduced by Synechococcus sp. Miami BG 043511 and Anabaena sp. TU 37-1, and demonstrate the ΔD values of their **hydrogen gas** are extremely low (about-600.PERMIL.) when compared with that of available water (-7.PERMIL.). This depletion gives a mean fractionation factor (A) of 0.43, which is similar to that calculated for hydrogen ions at equilibrium with water (0.35) and hydrogen produced by electrolysis of water (0.24) but significantly different from those of carbon bound hydrogens (>0.83). Thus hydrogen ions available for protonation of NADP+ may be extremely deuterium depleted. Our results may explain why D/H ratios of nitrated cellulose or lipids from most plants are always depleted relative to water available for photosynthesis. (author abst.)

L3 ANSWER 12 OF 53 JICST-EPlus COPYRIGHT 2006 JST on STN
ACCESSION NUMBER: 900913688 JICST-EPlus
TITLE: Microbial CO2 fixation-1-its effect on total emission of

greenhouse effect gases.
AUTHOR: SHIMA SEIGO; WATANABE YOSHITOMO; SAIKI HIROSHI; KIYONO MICHIYASU
CORPORATE SOURCE: Central Res. Inst. of Electric Power Industry, Abiko Res. Lab.
SOURCE: Denryoku Chuo Kenkyujo Abiko Kenkyujo Hokoku, (1990) no. U90020, pp. 52P. Journal Code: F0804C (Fig. 18, Tbl. 21, Ref. 17)
PUB. COUNTRY: Japan
DOCUMENT TYPE: Report; Article
LANGUAGE: Japanese
STATUS: New
AB Increase of greenhouse effect gases(GHG)concentration in the atomosphere might cause a global climate change. Carbon dioxide is a dominant GHG in the atomosphere. Electric power industries are emitting a large amount of CO2 from their thermal power plants. In this report, we describe the conversion of CO2 into organic matter by microorganisms and evaluate its effects on total GHG emission. Microalgae and hydrogen bacteria are able to fix a large amount of CO2 gas such as flue gasses. Microalgae require a wide area to harvest solar energy. Hydrogen bacteria need **hydrogen gas** as energy source. In order to fix 1% of total CO2 from the thermal power plants in Japan, a 700km2 area will be required for the microalgal cultivation, or 500,000 tons of **hydrogen gas** for the hydrogen bacteria. The products of microorganims (Single Cell Protein, SCP) can be used as feed instead of feed crops. Such utilization will have a effect on GHG emission decrease. If feed crop production were replaced with the microalgal cell production, it would result in some more CO2 emission with the energy consumption for the cell production and in less emission of CH4 and N2O from the farmland. If the effects of CH4 and N2O were normalized to the value of CO2, total reduction of GHG emission world be expected 7.1 tonC/tonC-cell by the microalgal replacement. For the hydrogen bacteria, GHG emission would be reduced by 5.2 tonC/tonC-cell, even the hydrogen were produced from natural gas. In addition to these effects, the alternatives for the production will prevent from deforestation which is caused by field development, since they do not need any farmland. (abridged author abst.)

L3 ANSWER 13 OF 53 JICST-EPlus COPYRIGHT 2006 JST on STN
ACCESSION NUMBER: 900889365 JICST-EPlus
TITLE: Wavelength-dependance of hydrogen evolution by cyanobacteria.
AUTHOR: ASADA YASUO; KAWAMURA SUGIO
CORPORATE SOURCE: Fermentation Res. Inst.
SOURCE: Kogyo Gijutsuin Biseibutsu Kogyo Gijutsu Kenkyujo Kenkyu Hokoku (Report of the Fermentation Research Institute), (1990) no. 73, pp. 57-64. Journal Code: F0051A (Fig. 3, Ref. 25)
ISSN: 0368-5365
PUB. COUNTRY: Japan
DOCUMENT TYPE: Journal; Article
LANGUAGE: Japanese
STATUS: New
AB Wavelength-dependance of hydrogen and oxygen evolution by a nitrogen-fixing cyanobacterium, Anabaena N-7363 was studied. Action spectrum of hydrogen evolution was identical to absorption spectrum of intact cells which was mainly due to chlorophyll a. Action spectrum of oxygen evolution had peaks around 600-650nm of wavelength which were due to phycobiliproteins. Conversion rate of light energy to **hydrogen gas** was also discussed. (author abst.)

L3 ANSWER 14 OF 53 JICST-EPlus COPYRIGHT 2006 JST on STN
ACCESSION NUMBER: 890340484 JICST-EPlus
TITLE: Utilization of plankton. 8 Plankton as energy resources. (4).
AUTHOR: YAMAGUCHI KATSUMI
CORPORATE SOURCE: Univ. of Tokyo, Faculty of Agriculture
SOURCE: Kaiyo to Seibutsu (Aquabiology), (1989) vol. 11, no. 2, pp. 102-105. Journal Code: S0220B (Fig. 2, Ref. 19)
ISSN: 0285-4376
PUB. COUNTRY: Japan

DOCUMENT TYPE: Journal; Commentary
LANGUAGE: Japanese
STATUS: New
AB Aspect and prospect of production of **hydrogen gas**, fuel oils and methane gas from phytoplankton are discussed from an angle of energy resources.(author abst.)

L3 ANSWER 15 OF 53 JICST-EPlus COPYRIGHT 2006 JST on STN
ACCESSION NUMBER: 880009658 JICST-EPlus
TITLE: Water biophotolysis system using cyanobacterial electrode.
AUTHOR: OCHIAI H; SHIBATA H; SAWA Y; INAMURA I; MORIKAWA W; MINAMI M
CORPORATE SOURCE: Shimane Univ., Matsue, JPN
SOURCE: Chem Lett, (1987) no. 9, pp. 1807-1810. Journal Code: S0742A (Fig. 3, Tbl. 1, Ref. 8)
CODEN: CMLTAG; ISSN: 0366-7022
PUB. COUNTRY: Japan
DOCUMENT TYPE: Journal; Short Communication
LANGUAGE: English
STATUS: New
AB By using living cyanobacterial electrode as a working electrode, hydrogen production was performed through water-biophotolysis with two-stage, three-electrode apparatus. Electrically reduced methyl viologen in the cathode vessel worked as a substrate of hydrogenase to evolve **hydrogen gas** in the presence of both phenazine methosulfate and NADH under concomitant supply of electric current.(author abst.)

L3 ANSWER 16 OF 53 JICST-EPlus COPYRIGHT 2006 JST on STN
ACCESSION NUMBER: 870157957 JICST-EPlus
TITLE: Screening for cyanobacteria that evolve molecular hydrogen under dark and anaerobic conditions.
AUTHOR: ASADA Y; KAWAMURA S
CORPORATE SOURCE: Fermentation Research Inst., Ibaraki-ken, JPN
SOURCE: J Ferment Technol, (1986) vol. 64, no. 6, pp. 553-556. Journal Code: G0535B (Tbl. 1, Ref. 35)
ISSN: 0385-6380
PUB. COUNTRY: Japan
DOCUMENT TYPE: Journal; Short Communication
LANGUAGE: English
STATUS: New
AB Cyanobacteria from culture collections were screened for those that evolve **hydrogen gas** endogenously under dark and anaerobic or microaerobic conditions. Twelve from 19 strains were demonstrated to evolve hydrogen, and the distribution of the activity was not related to nitrogen fixing capability or morphological grouping. The highest activity among those tested was 18.5Ml/16h/mg dry cells by an axenic culture of Spirulina platensis M-185.(author abst.)

L3 ANSWER 17 OF 53 CABA COPYRIGHT 2006 CABI on STN
ACCESSION NUMBER: 86:6047 CABA
DOCUMENT NUMBER: 19861900840
TITLE: The effect of nickel on hydrogen metabolism and nitrogen fixation in the cyanobacterium Anabaena cylindrica
AUTHOR: Daday, A.; Mackerras, A. H.; Smith, G. D.
CORPORATE SOURCE: Department of Biochemistry, Faculty of Science, Australian National University, GPO Box 4, Canberra ACT 2601, Australia.
SOURCE: Journal of General Microbiology, (1985) Vol. 131, No. 2, pp. 231-238. 5 fig., 1 tab. 37 ref.
ISSN: 0022-1287
DOCUMENT TYPE: Journal
LANGUAGE: English
ENTRY DATE: Entered STN: 19941101
Last Updated on STN: 19941101
AB A comparative study was made of the growth and nitrogen fixation of nickel-depleted and nickel-supplemented cultures of Anabaena cylindrica. Four sets of growth conditions were used, involving dark/light and continuous light regimes, anaerobic and aerobic conditions, light

limitation and supplementation of the gas phase with hydrogen. In each case nickel-containing cells had an active hydrogen uptake capacity whereas nickel-depleted cells did not. These differences in hydrogenase activities were not correlated with differences in acetylene reduction and growth rates, or fixed nitrogen, phycocyanin or chlorophyll contents. It is concluded that under the growth conditions used the capacity of cells to consume **hydrogen gas** confers no advantage to the organisms in terms of their growth rates and nitrogen fixation.

L3 ANSWER 18 OF 53 BIOSIS COPYRIGHT (c) 2006 The Thomson Corporation on STN DUPLICATE 8

ACCESSION NUMBER: 2000:492709 BIOSIS
DOCUMENT NUMBER: PREV200000492830
TITLE: Light dependent production of **hydrogen gas** by green **algae.** The future energy carrier in the classroom?.
AUTHOR(S): Wunschiers, Robbe [Reprint author]
CORPORATE SOURCE: Department of Physiological Botany, Uppsala University, Villavagen 6, 75236, Uppsala, Sweden
SOURCE: Journal of Biological Education, (Autumn, 2000) Vol. 34, No. 4, pp. 214-217. print.
CODEN: JBIEAO. ISSN: 0021-9266.
DOCUMENT TYPE: Article
LANGUAGE: English
ENTRY DATE: Entered STN: 15 Nov 2000
Last Updated on STN: 10 Jan 2002

AB **Hydrogen gas** is regarded as a potential candidate for a future energy economy. Research and development in the field of hydrogen energy is greatly encouraged on all continents. A wide range of microorganisms are able to produce **hydrogen gas**, among them photosynthetically active organisms that use light as their sole energy source. These organisms are good candidates for the photobiological production of **hydrogen gas.** Green **algae** are of particular interest since they are capable of splitting water during photosynthesis and of releasing **hydrogen gas** under certain conditions. This article describes a small bioreactor that can be run in the classroom and used to demonstrate the concept of photohydrogen production.

L3 ANSWER 19 OF 53 BIOSIS COPYRIGHT (c) 2006 The Thomson Corporation on STN

ACCESSION NUMBER: 2005:173897 BIOSIS
DOCUMENT NUMBER: PREV200500176674
TITLE: Approaches to developing biological H2-photoproducing organisms and processes.
AUTHOR(S): Ghirardi, M. L. [Reprint Author]; King, P. W.; Posewitz, M. C.; Maness, P. Ching; Fedorov, A.; Kim, K.; Cohen, J.; Schulten, K.; Seibert, M.
CORPORATE SOURCE: Natl Renewable Energy Lab, Golden, CO, USA
maria_ghirardi@nrel.gov
SOURCE: Biochemical Society Transactions, (February 2005) Vol. 33, No. Part 1, pp. 70-72. print.
CODEN: BCSTB5. ISSN: 0300-5127.
DOCUMENT TYPE: Article
LANGUAGE: English
ENTRY DATE: Entered STN: 4 May 2005
Last Updated on STN: 4 May 2005

AB The development of efficient biological systems for the direct photoproduction of H2 gas from water faces several challenges, the more serious of which is the sensitivity of the H2-evolving enzymes (hydrogenases) to O2, an obligatory by-product of photosynthesis. This high sensitivity is common to both FeFe and NiFe hydrogenases, and is caused by O2 binding to their respective metallocatalytic sites. This overview describes approaches to (i) molecular engineering of algal FeFe-hydrogenase to prevent O2 access to its catalytic site; (ii) transform a cyanobacterium with an O2-tolerant bacterial NiFe hydrogenase or (c) partially inactivate algal O2-evolution activity to create physiologically anaerobiosis and induce hydrogenase expression.

L3 ANSWER 20 OF 53 BIOSIS COPYRIGHT (c) 2006 The Thomson Corporation on

STN
ACCESSION NUMBER: 2004:325890 BIOSIS
DOCUMENT NUMBER: PREV200400327516
TITLE: Discovery of two novel radical S-adenosylmethionine proteins required for the assembly of an active (Fe) hydrogenase.
AUTHOR(S): Posewitz, Matthew C.; King, Paul W.; Smolinski, Sharon L.; Zhang, Liping; Seibert, Michael; Ghirardi, Maria L. [Reprint Author]
CORPORATE SOURCE: Natl Renewable Energy Lab, Colorado Sch Mines, Golden, CO, 80401, USA
maria_ghirardi@nrel.gov
SOURCE: Journal of Biological Chemistry, (June 11 2004) Vol. 279, No. 24, pp. 25711-25720. print.
CODEN: JBCHA3. ISSN: 0021-9258.
DOCUMENT TYPE: Article
LANGUAGE: English
ENTRY DATE: Entered STN: 29 Jul 2004
Last Updated on STN: 29 Jul 2004
AB To identify genes necessary for the photoproduction of H2 in Chlamydomonas reinhardtii, random insertional mutants were screened for clones unable to produce H2. One of the identified mutants, denoted hydEF-1, is incapable of assembling an active (Fe) hydrogenase. Although the hydEF-1 mutant transcribes both hydrogenase genes and accumulates full-length hydrogenase protein, H2 production activity is not observed. The HydEF protein contains two unique domains that are homologous to two distinct prokaryotic proteins, HydE and HydF, which are found exclusively in organisms containing (Fe) hydrogenase. In the C. reinhardtii genome, the HydEF gene is adjacent to another hydrogenase-related gene, HydG. All organisms with (Fe) hydrogenase and sequenced genomes contain homologues of HydE, HydF, and HydG, which, prior to this study, were of unknown function. Within several prokaryotic genomes HydE, HydF, and HydG are found in putative operons with (Fe) hydrogenase structural genes. Both HydE and HydG belong to the emerging radical S-adenosylmethionine (commonly designated "Radical SAM") superfamily of proteins. We demonstrate here that HydEF and HydG function in the assembly of (Fe) hydrogenase. Northern blot analysis indicates that mRNA transcripts for both the HydEF gene and the HydG gene are anaerobically induced concomitantly with the two C. reinhardtii (Fe) hydrogenase genes, HydA1 and HydA2. Complementation of the bx;1C. reinhardtii hydEF-1 mutant with genomic DNA corresponding to a functional copy of the HydEF gene restores hydrogenase activity. Moreover, co-expression of the C. reinhardtii HydEF, HydG, and HydA1 genes in Escherichia coli results in the formation of an active HydA1 enzyme. This represents the first report on the nature of the accessory genes required for the maturation of an active (Fe) hydrogenase.

L3 ANSWER 21 OF 53 BIOSIS COPYRIGHT (c) 2006 The Thomson Corporation on STN
ACCESSION NUMBER: 2003:328560 BIOSIS
DOCUMENT NUMBER: PREV200300328560
TITLE: A new oxygen sensitivity and its potential application in photosynthetic H2 production.
AUTHOR(S): Lee, James W. [Reprint Author]; Greenbaum, Elias
CORPORATE SOURCE: Chemical Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN, 37831-6194, USA
Leejw@ORNL.gov
SOURCE: Applied Biochemistry and Biotechnology, (Spring 2003) Vol. 105-108, pp. 303-313. print.
ISSN: 0273-2289 (ISSN print).
DOCUMENT TYPE: Article
LANGUAGE: English
ENTRY DATE: Entered STN: 16 Jul 2003
Last Updated on STN: 16 Jul 2003
AB We have discovered a new competitive pathway for O2 sensitivity in algal H2 production that is distinct from the O2 sensitivity of hydrogenase per se. This O2 sensitivity is apparently linked to the photosynthetic H2 production pathway that is coupled to proton translocation across the thylakoid membrane. Addition of the proton uncoupler carbonyl cyanide-p-trifluoromethoxy-phenylhydrazone eliminates this mode of O2

inhibition on H2 photoevolution. This newly discovered inhibition is most likely owing to background O2 that apparently serves as a terminal electron acceptor in competition with the H2 production pathway for photosynthetically generated electrons from water splitting. This O2-sensitive H2 production electron transport pathway was inhibited by 3(3,4-dichlorophenyl)1,1-dimethylurea. Our experiments demonstrated that this new pathway is more sensitive to O2 than the traditionally known O2 sensitivity of hydrogenase. This discovery provides new insight into the mechanism of O2 inactivation of hydrogenase and may contribute to the development of a more-efficient and robust system for photosynthetic H2 production.

L3 ANSWER 22 OF 53 BIOSIS COPYRIGHT (c) 2006 The Thomson Corporation on STN

ACCESSION NUMBER: 2002:379060 BIOSIS
DOCUMENT NUMBER: PREV200200379060
TITLE: Sustained hydrogen photoproduction by Chlamydomonas reinhardtii: Effects of culture parameters.
AUTHOR(S): Kosourov, Sergey; Tsygankov, Anatoly; Seibert, Michael; Ghirardi, Maria L. [Reprint author]
CORPORATE SOURCE: Basic Sciences Center, National Renewable Energy Laboratory, Golden, CO, 80401, USA
maria_ghirardi@nrel.gov
SOURCE: Biotechnology and Bioengineering, (June 30, 2002) Vol. 78, No. 7, pp. 731-740. print.
CODEN: BIBIAU. ISSN: 0006-3592.
DOCUMENT TYPE: Article
LANGUAGE: English
ENTRY DATE: Entered STN: 10 Jul 2002
Last Updated on STN: 10 Jul 2002

AB The green alga, Chlamydomonas reinhardtii, is capable of sustained H2 photoproduction when grown under sulfur-deprived conditions. This phenomenon is a result of the partial deactivation of photosynthetic O2-evolution activity in response to sulfur deprivation. At these reduced rates of water-oxidation, oxidative respiration under continuous illumination can establish an anaerobic environment in the culture. After 10-15 hours of anaerobiosis, sulfur-deprived algal cells induce a reversible hydrogenase and start to evolve H2 gas in the light. Using a computer-monitored photobioreactor system, we investigated the behavior of sulfur-deprived **algae** and found that: (1) the cultures transition through five consecutive phases: an aerobic phase, an O2-consumption phase, an anaerobic phase, a H2-production phase and a termination phase; (2) synchronization of cell division during pre-growth with 14:10 h light:dark cycles leads to earlier establishment of anaerobiosis in the cultures and to earlier onset of the H2-production phase; (3) re-addition of small quantities of sulfate (12.5-50 muM MgSO4, final concentration) to either synchronized or unsynchronized cell suspensions results in an initial increase in culture density, a higher initial specific rate of H2 production, an increase in the length of the H2-production phase, and an increase in the total amount of H2 produced; and (4) increases in the culture optical density in the presence of 50 muM sulfate result in a decrease in the initial specific rates of H2 production and in an earlier start of the H2-production phase with unsynchronized cells. We suggest that the effects of sulfur re-addition on H2 production, up to an optimal concentration, are due to an increase in the residual water-oxidation activity of the algal cells. We also demonstrate that, in principle, cells synchronized by growth under light:dark cycles can be used in an outdoor H2-production system without loss of efficiency compared to cultures that up until now have been pre-grown under continuous light conditions.

L3 ANSWER 23 OF 53 BIOSIS COPYRIGHT (c) 2006 The Thomson Corporation on STN

ACCESSION NUMBER: 2002:356788 BIOSIS
DOCUMENT NUMBER: PREV200200356788
TITLE: Effect of pH on microbial hydrogen fermentation.
AUTHOR(S): Lee, Young Joon; Miyahara, Takashi; Noike, Tatsuya [Reprint author]
CORPORATE SOURCE: Department of Civil Engineering, Graduate School of Engineering, Tohoku University, Sendai, 980-8579, Japan

noike@civil.tohoku.ac.jp
SOURCE: Journal of Chemical Technology and Biotechnology, (June, 2002) Vol. 77, No. 6, pp. 694-698. print.
CODEN: JCTBED. ISSN: 0268-2575.
DOCUMENT TYPE: Article
LANGUAGE: English
ENTRY DATE: Entered STN: 26 Jun 2002
Last Updated on STN: 26 Jun 2002

AB The influence of initial pH of the culture medium on hydrogen production was studied using sucrose solution and a mixed microbial flora from a soybean-meal silo. Hydrogen production was not observed at pH values of 3.0, 11.0 and 12.0 but low production was observed at pH values 5.0 and 5.5. The pH of the experimental mixture decreased rapidly and produced **hydrogen gas** within 30 h. Methane was not detected at initial pH values between 6.0 and 10.0. The sucrose degradation efficiency increased as the initial pH value increased from 3.0 to 9.0. The maximum sucrose degradation efficiency of 95% was observed at pH 9.0. The maximum specific production yields of hydrogen, VFAs and alcohols were 126.9 cm3 g-1 sucrose (pH of 9.0), 0.7 gCOD g-1 sucrose (pH of 8.0) and 128.7 mgCOD g-1 sucrose (pH of 9.0), respectively. The relationship between the hydrogen ion concentration and the specific hydrogen production rate has been mathematically described. The best kinetic parameters on the specific hydrogen production rate were KOH=1.0X10-7 mol dm-3 and KH=1.1X10-4 mol dm-3 (r2=0.86). The maximum specific hydrogen production rate was 37.0 cm3 g-1 VSS h-1.

L3 ANSWER 24 OF 53 BIOSIS COPYRIGHT (c) 2006 The Thomson Corporation on STN
ACCESSION NUMBER: 2002:277776 BIOSIS
DOCUMENT NUMBER: PREV200200277776
TITLE: Cloning of two hydrogenase genes from the green alga Chlamydomonas reinhardtii.
AUTHOR(S): Forestier, M. [Reprint author]; Plummer, S.; Ahmann, D.; Seibert, M. [Reprint author]; Ghirardi, M. [Reprint author]
CORPORATE SOURCE: National Renewable Energy Laboratory, 1617 Cole Blvd., Golden, CO, 80401, USA
SOURCE: Photosynthesis Research, (2001) Vol. 69, No. 1-3, pp. 256-257. print.
Meeting Info.: 12th International Congress on Photosynthesis. Brisbane, Australia. August 18-23, 2001. International Society of Photosynthesis Research.
CODEN: PHRSDI. ISSN: 0166-8595.
DOCUMENT TYPE: Conference; (Meeting)
Conference; Abstract; (Meeting Abstract)
LANGUAGE: English
ENTRY DATE: Entered STN: 8 May 2002
Last Updated on STN: 8 May 2002

L3 ANSWER 25 OF 53 BIOSIS COPYRIGHT (c) 2006 The Thomson Corporation on STN
ACCESSION NUMBER: 2000:125978 BIOSIS
DOCUMENT NUMBER: PREV200000125978
TITLE: Sustained photobiological **hydrogen gas** production upon reversible inactivation of oxygen evolution in the green alga Chlamydomonas reinhardtii.
AUTHOR(S): Melis, Anastasios [Reprint author]; Zhang, Liping; Forestier, Marc; Ghirardi, Maria L.; Seibert, Michael
CORPORATE SOURCE: Department of Plant and Microbial Biology, University of California, 111 Koshland Hall, Berkeley, CA, 94720-3102, USA
SOURCE: Plant Physiology (Rockville), (Jan., 2000) Vol. 122, No. 1, pp. 127-135. print.
CODEN: PLPHAY. ISSN: 0032-0889.
DOCUMENT TYPE: Article
LANGUAGE: English
ENTRY DATE: Entered STN: 5 Apr 2000
Last Updated on STN: 4 Jan 2002

AB The work describes a novel approach for sustained photobiological production of H2 gas via the reversible hydrogenase pathway in the green alga Chlamydomonas reinhardtii. This single-organism, two-stage H2

production method circumvents the severe O2 sensitivity of the reversible hydrogenase by temporally separating photosynthetic O2 evolution and carbon accumulation (stage 1) from the consumption of cellular metabolites and concomitant H2 production (stage 2). A transition from stage 1 to stage 2 was effected upon S deprivation of the culture, which reversibly inactivated photosystem II (PSII) and O2 evolution. Under these conditions, oxidative respiration by the cells in the light depleted O2 and caused anaerobiosis in the culture, which was necessary and sufficient for the induction of the reversible hydrogenase. Subsequently, sustained cellular H2 gas production was observed in the light but not in the dark. The mechanism of H2 production entailed protein consumption and electron transport from endogenous substrate to the cytochrome b6-f and PSI complexes in the chloroplast thylakoids. Light absorption by PSI was required for H2 evolution, suggesting that photoreduction of ferredoxin is followed by electron donation to the reversible hydrogenase. The latter catalyzes the reduction of protons to molecular H2 in the chloroplast stroma.

L3 ANSWER 26 OF 53 BIOSIS COPYRIGHT (c) 2006 The Thomson Corporation on STN

ACCESSION NUMBER: 1991:92922 BIOSIS
DOCUMENT NUMBER: PREV199191051812; BA91:51812
TITLE: MICROBIAL CARBON DIOXIDE FIXATION 1. ITS EFFECT ON TOTAL EMISSION OF GREENHOUSE EFFECT GASES.
AUTHOR(S): SHIMA S [Reprint author]; WATANABE Y; SAIKI H; KIYONO M
CORPORATE SOURCE: ABIKO RES LAB, JPN
SOURCE: Denryoku Chuo Kenkyusho Hokoku, (1990) No. U90020, pp. I-IV, 1-46.
ISSN: 0387-2394.
DOCUMENT TYPE: Article
FILE SEGMENT: BA
LANGUAGE: JAPANESE
ENTRY DATE: Entered STN: 11 Feb 1991
Last Updated on STN: 12 Feb 1991

AB Increase of greenhouse effect gases (GHG) concentration in the atmosphere might cause a global climate change. Carbon dioxide is a dominant GHG in the atmosphere. Electric power industries are emitting a large amount of CO2 from their thermal power plants. In this report, we describe the conversion of CO2 into organic matter by microorganisms and evaluate its effects on total GHG emission. Microalgae and hydrogen are able to fix a large amount of CO2 gas such as flue gases. Microalgae require a wide area to harvest solar energy. Hydrogen bacteria need **hydrogen gas** as energy source. In order to fix 1% of total CO2 from the thermal power plants in Japan, a 700 km2 area will be required for the microalgal cultivation, or 500,000 tons of **hydrogen gas** for the hydrogen bacteria. The products of microorganisms (Single Cell Protein, SCP) can be used as feed instead of feed crops. Such utilization will have a effect on GHG emission decrease. If feed crop production were replaced with the microalgal cell production, it would result in some more CO2 emission with the energy consumption for the cell production and in less emission of CH4 and N2O from the farmland. If the effects of CH4 and N2O were normalized to the value of CO2, total reduction of GHG emission would be expected 7.1 tonC/tonC-cell by the microalgal replacement. For the hydrogen bacteria, GHG emission would be reduced by 5.2 tonC/tonC-cell, even the hydrogen were produced from natural gas. In addition to these effects, the alternatives for the crop production will prevent from deforestation which is caused by field development, since they do not need any farmland. This effect would correspond to saving 208 tonC from the deforestation per 1 tonC yearly feed production.

L3 ANSWER 27 OF 53 BIOSIS COPYRIGHT (c) 2006 The Thomson Corporation on STN

ACCESSION NUMBER: 1987:188156 BIOSIS
DOCUMENT NUMBER: PREV198783096280; BA83:96280
TITLE: SELECTIVE INHIBITORS FOR CONTINUOUS NON-AXENIC HYDROGEN PRODUCTION BY RHODOBACTER-CAPSULATUS.
AUTHOR(S): LIESSENS J [Reprint author]; VERSTRAETE W
CORPORATE SOURCE: LAB MICROBIOL ECOL, STATE UNIV GHENT, COUPURE L 653, B-9000 GENT, BELGIUM
SOURCE: Journal of Applied Bacteriology, (1986) Vol. 61, No. 6, pp.

547-558.
CODEN: JABAA4. ISSN: 0021-8847.
DOCUMENT TYPE: Article
FILE SEGMENT: BA
LANGUAGE: ENGLISH
ENTRY DATE: Entered STN: 20 Apr 1987
Last Updated on STN: 20 Apr 1987

AB To produce H2 continuously by photosynthetically grown Rhodobacter capsulatus in non-axenic anaerobic reactors, the interaction between the phototroph and possible contaminants was studied and the ecological competitiveness of the Rhodobacter spp. in nitrogen-limited conditions was determined. Experimental test runs showed that blue-green and green **algae**, sulphate-reducing acetogenic and methanogenic bacteria significantly interfere with the net amounts of H2 produced by photobacteria. Therefore, inhibitors to control the growth of those contaminants selectively were screened. By applying a combination of chloroxuron (10 mg/l) and cycloheximide (10 mg/l) against **algae**, isohumulones (30 bitter units/l) and molybdate (0.5 g/l) against sulphate-reducing bacteria and isohumulones and chloroform (10 mg/l) against acetogens and methanogens, photoreactors could be operated in a non-axenic way and continued to produce **hydrogen gas** at rates depending on the feed quality varying from 333 to 676 ml H2/l reactor/d, for a period of 116 d without apparent interference from other microbial contaminants. These findings have a considerable potential for facilitating the isolation of organo-phototrophs and the production of H2 by these bacteria.

L3 ANSWER 28 OF 53 BIOSIS COPYRIGHT (c) 2006 The Thomson Corporation on STN
ACCESSION NUMBER: 1982:121750 BIOSIS
DOCUMENT NUMBER: PREV198223051742; BR23:51742
TITLE: **HYDROGEN GAS** PRODUCTION IN EUKARYOTIC **ALGAE.**
AUTHOR(S): BRAND J J [Reprint author]
CORPORATE SOURCE: DEP BOTANY, UNIV TEX, AUSTIN, TX 78712, USA
SOURCE: Plant Physiology (Rockville), (1982) Vol. 69, No. 4 SUPPL, pp. 76.
Meeting Info.: MEETING OF THE AMERICAN SOCIETY OF PLANT PHYSIOLOGISTS, CHAMPAIGN-URBANA, ILL., USA, JUNE 13-17, 1982. PLANT PHYSIOL.
CODEN: PLPHAY. ISSN: 0032-0889.
DOCUMENT TYPE: Conference; (Meeting)
FILE SEGMENT: BR
LANGUAGE: ENGLISH

L3 ANSWER 29 OF 53 BIOSIS COPYRIGHT (c) 2006 The Thomson Corporation on STN
ACCESSION NUMBER: 1980:219868 BIOSIS
DOCUMENT NUMBER: PREV198070012364; BA70:12364
TITLE: THE TURNOVER TIMES AND POOL SIZES OF PHOTOSYNTHETIC HYDROGEN PRODUCTION BY GREEN **ALGAE.**
AUTHOR(S): GREENBAUM E [Reprint author]
CORPORATE SOURCE: OAK RIDGE NATL LAB, CHEM TECHNOL DIV, PO BOX X, OAK RIDGE, TENN 37830, USA
SOURCE: Solar Energy, (1979) Vol. 23, No. 4, pp. 315-320.
CODEN: SRENA4. ISSN: 0038-092X.
DOCUMENT TYPE: Article
FILE SEGMENT: BA
LANGUAGE: ENGLISH

AB An investigation of the turnover times of photobiological production of **hydrogen gas** by green **algae** [Chlamydomonas reinhardtii, Scenedesmus obliquus and Chlorella vulgaris] indicate that the photoreactions associated with molecular hydrogen production have promising properties for solar energy conversion and storage. The intrinsic kinetic rate capability of the hydrogen photoapparatus in green **algae** apparently can keep pace with the incidence rate of light quanta, even in full sunlight; and the photogenerated electrons for hydrogen production probably lie in the mainstream of the electron transport chain of photosynthesis. These results have been obtained by performing the 1st measurements on the turnover times and pool sizes of

photosynthetic hydrogen production. For the 3 spp. of green **algae** studied, the turnover times range from 0.1-3 ms. The turnover time for photosynthetic hydrogen production is, therefore, comparable to that for O2 production. Rapid multiple flash experiments were performed which indicate that the immediate source of reductant for photosynthetic hydrogen production is derived from a pool of 5-20 equivalents, depending on the alga. This pool is probably the plastoquinone pool linking the 2 photosystems of photosynthesis.

L3 ANSWER 30 OF 53 BIOSIS COPYRIGHT (c) 2006 The Thomson Corporation on STN

ACCESSION NUMBER: 1978:168125 BIOSIS
DOCUMENT NUMBER: PREV197865055125; BA65:55125
TITLE: THE PROBLEM OF PHOTOSYNTHETIC HYDROGEN.
AUTHOR(S): KRASNOVSKII A A [Reprint author]
CORPORATE SOURCE: AN BAKH INST BIOCHEM, ACAD SCI USSR, MOSCOW, USSR
SOURCE: Izvestiya Akademii Nauk SSSR Seriya Biologicheskaya, (1977) No. 5, pp. 650-662.
CODEN: IANBAM. ISSN: 0002-3329.
DOCUMENT TYPE: Article
FILE SEGMENT: BA
LANGUAGE: RUSSIAN

AB A review is presented on the hydrogen photoproduction in algal cells and model systems composed of chlorophyll, NADH, methylviologen and bacterial hydrogenase. Hydrogen photoevolution by Chlorella was studied with the aid of gas chromatography, the involvement of carbon cycles in the process was confirmed. To simulate the photochemical stage of the reaction model systems were proposed. NADH excited in the main absorption band (365 nm) is able to reduce viologens and ferredoxin; in the presence of hydrogenase H2 gas is evolved. The reaction is sensitized to visible light by porphyrins. In aqueous solutions of chlorophyll solubilized by detergents + electron donor (NADH, cysteine, etc.) + bacterial hydrogenase, **hydrogen gas** is evolved under the action of red light; efficiency of the reaction is comparable with that of chloroplast suspensions; methylviologen enhances H2 photoproduction. The inorganic photocatalysts (TiO2, ZnO) are able to photoreduce viologens and produce H2 in similar systems under the action of ultraviolet light (365 nm). The mechanism of the reactions is considered.

L3 ANSWER 31 OF 53 CAPLUS COPYRIGHT 2006 ACS on STN DUPLICATE 1

ACCESSION NUMBER: 2006:64725 CAPLUS
TITLE: Bio-hydrogen production from waste materials
AUTHOR(S): Kapdan, Ilgi Karapinar; Kargi, Fikret
CORPORATE SOURCE: Department of Environmental Engineering, Dokuz Eylul University, Buca, Izmir, Turk.
SOURCE: Enzyme and Microbial Technology (2006), 38(5), 569-582
CODEN: EMTED2; ISSN: 0141-0229
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Hydrogen is a valuable gas as a clean energy source and as feedstock for some industries. Therefore, demand on hydrogen production has increased considerably in recent years. Electrolysis of water, steam reforming of hydrocarbons and auto-thermal processes are well-known methods for **hydrogen gas** production, but not cost-effective due to high energy requirements. Biol. production of **hydrogen gas** has significant advantages over chemical methods. The major biol. processes utilized for **hydrogen gas** production are bio-photolysis of water by **algae**, dark and photo-fermentation of organic materials, usually carbohydrates by bacteria. Sequential dark and photo-fermentation process is a rather new approach for bio-hydrogen production One of the major problems in dark and photo-fermentative hydrogen production is the raw material cost. Carbohydrate rich, nitrogen deficient solid wastes such as cellulose and starch containing agricultural and food industry wastes and some food industry wastewaters such as cheese whey, olive mill and bakers yeast industry wastewaters can be used for hydrogen production by using suitable bio-process technologies. Utilization of aforementioned wastes for hydrogen production provides inexpensive energy generation with simultaneous waste treatment. This review article summarizes bio-hydrogen production from some waste materials. Types of potential waste materials, bio-processing strategies,

microbial cultures to be used, bio-processing conditions and the recent developments are discussed with their relative advantages.

L3 ANSWER 32 OF 53 CAPLUS COPYRIGHT 2006 ACS on STN DUPLICATE 2
ACCESSION NUMBER: 2006:116366 CAPLUS
TITLE: Regulation of hydrogen production by uncoupler CCCP in green **algae** Chlamydomonas reinhardtii
AUTHOR(S): Ran, Chun-Qiu; Zhang, Wei; Yu, Xing-Ju; Jin, Mei-Fang; Deng, Mai-Cun
CORPORATE SOURCE: Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian, 116023, Peop. Rep. China
SOURCE: Gaodeng Xuexiao Huaxue Xuebao (2006), 27(1), 62-66
CODEN: KTHPDM; ISSN: 0251-0790
PUBLISHER: Gaodeng Jiaoyu Chubanshe
DOCUMENT TYPE: Journal
LANGUAGE: Chinese
AB Uncoupler, carbonylcyanide-m-chlorophenylhydrazone [CCCP], can markedly inhibit the photochem. activity of photosystem II and repress the rate of photosynthetic oxygen evolution. As a result, the anaerobic condition can promptly induce hydrogenase expression and accelerate hydrogen photoprodn. under the continuous illumination by Chlamydomonas reinhardtii. When C. reinhardtii cultured in TAP medium and treated with 0, 5 and 15 μmol/L CCCP under the continuous illumination, the photochem. activity of **algae** could not be obviously inhibited. But 15 and 20 μmol/L CCCP could markedly depress the photochem. activity and substantial amount of **hydrogen gas** was photoproduced. The photochem. activity of C. reinhardtii cultured with TAP-S at all concns. of CCCP under the continuous illumination was distinctly inhibited and the cultures photoproduced **hydrogen gas** rapidly. The **algae** of C. reinhardtii cultured with TAP and TAP-S medium, different concns. of CCCP altered the process of hydrogen metabolism and the efficiency of utilization and conversion of solar energy by the center of PS II.

L3 ANSWER 33 OF 53 CAPLUS COPYRIGHT 2006 ACS on STN DUPLICATE 4
ACCESSION NUMBER: 2002:726156 CAPLUS
DOCUMENT NUMBER: 138:124858
TITLE: [Fe]-hydrogenases in green **algae**: photo-fermentation and hydrogen evolution under sulfur deprivation
AUTHOR(S): Winkler, Martin; Hemschemeier, Anja; Gotor, Cecilia; Melis, Anastasios; Happe, Thomas
CORPORATE SOURCE: Botanisches Institut der Universitat Bonn, Bonn, 53115, Germany
SOURCE: International Journal of Hydrogen Energy (2002), 27(11-12), 1431-1439
CODEN: IJHEDX; ISSN: 0360-3199
PUBLISHER: Elsevier Science Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English
AB [Fe]-hydrogenases and H2 metabolism are widely distributed among green **algae.** The enzymes are simple structured and catalyze H2 evolution with similar rates than the more complex [Fe]-hydrogenases from bacteria. Different green algal species developed diverse strategies to survive under sulfur deprivation. Chlamydomonas reinhardtii evolves large quantities of **hydrogen gas** in the absence of sulfur. In a sealed culture of C. reinhardtii, the photosynthetic O2 evolution rate drops below the rate of respiratory O2 consumption due to a reversible inhibition of photosystem II, thus leading to an intracellular anaerobiosis. The algal cells survive under these anaerobic conditions by switching their metabolism to a kind of photo-fermentation Although possessing a functional [Fe]-hydrogenase gene, the cells of Scenedesmus obliquus produce no significant amts. of H2 under S-depleted conditions. S. obliquus decreases almost the complete metabolic activities while maintaining a low level of respiratory activity.
REFERENCE COUNT: 31 THERE ARE 31 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 34 OF 53 CAPLUS COPYRIGHT 2006 ACS on STN DUPLICATE 5
ACCESSION NUMBER: 2002:726122 CAPLUS

DOCUMENT NUMBER: 138:220925
TITLE: Hydrogen in education - a biological approach
AUTHOR(S): Wunschiers, Robbe; Lindblad, Peter
CORPORATE SOURCE: Department of Physiol. Botany, Uppsala University, EBC, Uppsala, 75236, Swed.
SOURCE: International Journal of Hydrogen Energy (2002), 27(11-12), 1131-1140
CODEN: IJHEDX; ISSN: 0360-3199
PUBLISHER: Elsevier Science Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB **Hydrogen gas** is regarded as a potential candidate for a future energy economy. The change towards new energy systems with **hydrogen gas** as an energy carrier will have an immense impact on society. Thus, an integrate part of current research and development must be the inclusions of the new technol. into public education. A model bioreactor for light-dependent production of **hydrogen gas** with green **algae** has been developed for biol. education. Various simple photo-bioreactor types were analyzed for their capability to produce hydrogen under different conditions. The focus laid on functionality and simplicity rather than on high efficiency. Easy-to-handle systems that can be used in the classroom are presented. In a more sophisticated version, a proton exchange membrane (PEM)-fuel cell was connected to a continuous gas flow tube bioreactor. A software interface was developed to design to read light intensity, temperature and power generation by the bioreactor and the connected fuel cell, resp. Thus, the bioreactor is specially aimed at integrative teaching in natural science and computer technol. at middle and high school level.

REFERENCE COUNT: 31 THERE ARE 31 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 35 OF 53 CAPLUS COPYRIGHT 2006 ACS on STN DUPLICATE 9
ACCESSION NUMBER: 1998:707014 CAPLUS
DOCUMENT NUMBER: 130:15757
TITLE: Development of a low-cost oxy-hydrogen bio-fuel cell for generation of electricity using Nostoc as a source of hydrogen
AUTHOR(S): Dawar, Sangeeta; Behera, B. K.; Mohanty, Prasanna
CORPORATE SOURCE: Fuel Biotech. Laboratory, Department of Biosciences, Maharshi Dayanand University, Rohtak, 124001, India
SOURCE: International Journal of Energy Research (1998), 22(12), 1019-1028
CODEN: IJERDN; ISSN: 0363-907X
PUBLISHER: John Wiley & Sons Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB An oxy-hydrogen bio-fuel cell, based on a carbon-carbon electrode has been fabricated. The electrode pellets were prepared by taking carbon powder mixed with polyvinylalc. as a binder. The anode was charged with Co-Al spinel mixed oxide at 700°, 30% KOH acted as an electrolyte. For the cyanobacterial bioreactor, a potential heterocystous blue green alga of Nostoc spp. has been used for hydrogen production and elec. energy generation. Various nutrient enrichment techniques are employed to increase the hydrogen generation efficiency of the **algae.** One liter free cell algal reactor attached to the fuel cell, at the anode end for **hydrogen gas** input, generated about 300 mV of voltage and 100 mA of current. Our present findings on the development of a low cost fuel cell with high efficiency of current output may be helpful in commercializing this technol.

REFERENCE COUNT: 35 THERE ARE 35 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 36 OF 53 CAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 2005:141224 CAPLUS
DOCUMENT NUMBER: 142:238780
TITLE: A composite layered biostructure containing a phototrophic genetically engineered Rhodopseudomonas palustris or other microbe for the production of hydrogen

INVENTOR(S): Flickinger, Michael C.; Rey, Federico; Harwood, Caroline S.
PATENT ASSIGNEE(S): Regents of the University of Minnesota, USA; University of Iowa Research Foundation
SOURCE: PCT Int. Appl., 61 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2005014805	A1	20050217	WO 2004-US26257	20040809
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
RW: BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
US 2005176131	A1	20050811	US 2004-915934	20040809
PRIORITY APPLN. INFO.:			US 2003-493745P	P 20030808

AB The present invention provides composite biol. devices that include biol. material as an integral component thereof. The devices can be used for producing **hydrogen gas**, for example. The present invention is directed to a composite biol. device comprising a layered biostructure comprising biol. material embedded in a polymer layer and addnl. porous layer that does not contain a biol. material. The device is used for producing **hydrogen gas** or generating electricity. Biol. material may include bacterial cells, **algae**, plant cells, insect cells, and the like. Examples of bacterial cells include E. coli, Rhodopseudomonas, Rubrivivax, Rhodobacter, Rhodococcus, Thermotoga, Shewanella, Clostridium, photosynthetic cyanobacteria, as well as Geobacter. The biol. material is phototrophic, metabolically active and genetically optimized for light absorption and/or H2 gas production Construction of Rhodopseudomonas palustris with mutated nitrogenase that results in increased H2 gas evolution relative to the wild-type organism is disclosed. Preparation of coating of R. palustris is disclosed and H2 production by R. palustris is characterized.
REFERENCE COUNT: 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 37 OF 53 CAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 2005:481668 CAPLUS
TITLE: Photoproduction of hydrogen using phototrophic purple non-sulfur (PNS) bacteria in column bioreactor
AUTHOR(S): Nath, Kaushik; Das, Debabrata
CORPORATE SOURCE: Department of Biotechnology, Indian Institute of Technology, Kharagpur, 721 302, India
SOURCE: Photo/Electrochemistry & Photobiology in the Environment, Energy and Fuel (2005), 43-59.
Editor(s): Kaneco, Satoshi; Viswanathan, B.; Funasaka, Kunihiro. Research Signpost: Trivandrum, India.
CODEN: 69GWL8; ISBN: 81-308-0000-4
DOCUMENT TYPE: Conference
LANGUAGE: English

AB Phototrophic (or photosynthetic) bacteria are widely recognized as one of the potent prokaryotes for biol. hydrogen production from organic compds. by an anaerobic light-dependent electron transfer process. They are favorable candidates for biol. hydrogen production due to their high conversion efficiency and versatility of the substrate utilization. The efficiency of light energy used for the production of hydrogen by photosynthetic bacteria is theor. much higher than that by cyanobacteria. Or green **algae** . The present paper deals with the photosynthetic production of hydrogen from various pure substrates in a laboratory-scale tubular photobioreactor. To date,

Rhodobacter sphaeroides has been identified as the bacterium having the highest hydrogen-producing rate [260 mL / (mg. h)], with a photo-energy conversion efficiency of 7% (per cent ratio of combustion energy of hydrogen and incident solar energy). Therefore for the present study Rhodobacter sphaeroides O. U 001 was selected as a key organism. Photofermentation was carried out in a 500 mL jacketed glass-column photobioreactor under anaerobic condition. The reaction temperature was maintained by circulation of water from a constant temperature circulating water bath. Illumination was provided by tungsten lamps, of approx. 5500-lx intensity from a distance of 30-cm. **Hydrogen gas** production was studied in batch system using various organic acids as substrates. The evolved gas was collected in a gas collector by displacement of water after absorbing CO2 in 30% KOH (w/v) solution Gas production rate was found to be directly proportional with the rate of growth of bacteria. Effects of various light parameters such as light intensity, and light energy conversion efficiency on the photoprodn. of hydrogen were also incorporated.

REFERENCE COUNT: 39 THERE ARE 39 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 38 OF 53 CAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 2004:1001841 CAPLUS
DOCUMENT NUMBER: 142:357580
TITLE: A catalytic hydropyrolysis method for the rapid screening of microbial cultures for lipid biomarkers
AUTHOR(S): Love, Gordon D.; Bowden, Stephen A.; Jahnke, Linda L.; Snape, Colin E.; Campbell, Christine N.; Day, John G.; Summons, Roger E.
CORPORATE SOURCE: Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, MA, 01239, USA
SOURCE: Organic Geochemistry (2004), Volume Date 2005, 36(1), 63-82
CODEN: ORGEDE; ISSN: 0146-6380
PUBLISHER: Elsevier Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB A catalytic hydropyrolysis procedure was developed for rapidly assessing the relative abundances and variety of different biomarker lipid structures in microbial cultures by reductively converting free functionalized and polymeric lipids within whole cells into hydrocarbons. High pressure **hydrogen gas** and a molybdenum catalyst were used to target and cleave carbon-oxygen covalent bonds (particularly ester, alc., acid and ether) and the pyrolysis process was conducted in an open-system reactor configuration to minimize structural and stereochem. rearrangements in the products. A revised exptl. protocol, involving a modified catalyst-loading procedure, careful use of a silica support substrate and a revised temperature program was tested and optimized for handling biomass. Partial hydrogenation of double bonds inevitably did occur although some unsatn. was preserved, particularly within branched and polycyclic hydrocarbon structures. This exptl. approach aids the ability to optimally correlate fossil biomarker signals found in the sedimentary record with their lipid precursors found in extant organisms. The technique complements more rigorous, but time-consuming, chemical approaches used for elucidating the exact chemical structures of intact functionalized lipids by providing a rapid means by which to screen microbial cultures.

REFERENCE COUNT: 82 THERE ARE 82 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L3 ANSWER 39 OF 53 CAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 2003:634036 CAPLUS
DOCUMENT NUMBER: 139:178821
TITLE: Modulation of sulfate permease for photosynthetic hydrogen production
INVENTOR(S): Melis, Anastasios; Wintz, Hsu-ching Chen
PATENT ASSIGNEE(S): The Regents of the University of California, USA
SOURCE: PCT Int. Appl., 80 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent

LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2003067213	A2	20030814	WO 2003-US2198	20030124
WO 2003067213	A3	20040122		
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
US 2003162273	A1	20030828	US 2003-350298	20030122
CA 2472765	AA	20030814	CA 2003-2472765	20030124
EP 1472338	A2	20041103	EP 2003-708872	20030124
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
JP 2005516629	T2	20050609	JP 2003-566515	20030124

PRIORITY APPLN. INFO.:			
US 2002-354760P	P	20020204	
US 2002-377902P	P	20020502	
US 2003-350298	A	20030122	
WO 2003-US2198	W	20030124	

AB Sustained hydrogen production is obtained by the culturing of a genetically-modified **algae**, where the ability of the chloroplasts to intake sulfate is reduced or eliminated compared to wild-type **algae.** The alga is cultured in a sealed environment in a liquid or solid medium that contains sulfur, and hydrogen is generated continuously. Alternatively, the **algae** may be cultured in the presence of bacteria that also produce **hydrogen gas.** The hydrogen produced can be collected and used as a clean energy source. Thus the sulP gene of Chlamydomonas reinhardtii encoding a sulfate permease was isolated and characterized. This information was then used to construct a plasmid bearing an antisense fragment of the sulP gene. The antisense plasmid vector was then employed to obtain sulP knockout mutants of Chlamydomonas reinhardtii.

L3 ANSWER 40 OF 53 CAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1986:455753 CAPLUS
DOCUMENT NUMBER: 105:55753
TITLE: Use of hydrogen for the elimination of matrix interferences in the determination of lead by graphite furnace atomic absorption spectrometry
AUTHOR(S): Novak, L.; Stoeppler, M.
CORPORATE SOURCE: Inst. Appl. Phys. Chem., Nucl. Res. Cent. (KFA) Juelich, Juelich, D-5170, Fed. Rep. Ger.
SOURCE: Fresenius' Zeitschrift fuer Analytische Chemie (1986), 323(7), 737-41
CODEN: ZACFAU; ISSN: 0016-1152
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Comparatively high S contents in brown **algae** (Fucus vesiculosus) cause interferences in the determination of Pb by graphite furnace atomic absorption spectrometry. These cannot always be eliminated by the application of the L'vov platform, matrix modifiers recommended for Pb [such as (NH4)2HPO4 and Mg(NO3)2], Zeeman-effect background correction, and peak area evaluation. The behavior of the Pb absorbance signal obtained from the L'vov platform inserted into an uncoated as well as a pyrolytically coated graphite tube was examined in the presence of Na2SO4 and MgSO4 as interferents of (NH4)2HPO4 and Mg(NO)2 as matrix modifiers. Accurate Pb detns. could only be performed when H was used as alternate gas during drying and charring steps since this eliminated the interferences caused by sulfates. Anal. signals with other matrixes were also improved under these conditions.

L3 ANSWER 41 OF 53 LIFESCI COPYRIGHT 2006 CSA on STN
ACCESSION NUMBER: 2000:66270 LIFESCI
TITLE: Process for selection of oxygen-tolerant algal mutants that produce H sub(2)
AUTHOR: Ghirardi, M.; Seibert, M.
CORPORATE SOURCE: Midwest Research Institute
SOURCE: (19990216) . US Patent: 5871952; US CLASS: 435/34; 435/168; 435/173.1; 435/173.9; 435/244; 435/245; 435/257.1; 435/257.6..
DOCUMENT TYPE: Patent
FILE SEGMENT: Q4
LANGUAGE: English
SUMMARY LANGUAGE: English
AB A process for selection of oxygen-tolerant, H sub(2) -producing algal mutant cells comprising: (a) growing algal cells photoautotrophically under fluorescent light to mid log phase; (b) inducing algal cells grown photoautrophically under fluorescent light to mid log phase in step (a) anaerobically by (1) resuspending the cells in a buffer solution and making said suspension anaerobic with an inert gas; (2) incubating the suspension in the absence of light at ambient temperature; (c) treating the cells from step (b) with metronidazole, sodium azide, and added oxygen to controlled concentrations in the presence of white light. (d) washing off metronidazole and sodium azide to obtain final cell suspension; (e) plating said final cell suspension on a minimal medium and incubating in light at a temperature sufficient to enable colonies to appear; (f) counting the number of colonies to determine the percent of mutant survivors; and (g) testing survivors to identify oxygen-tolerant H sub(2) -producing mutants.

L3 ANSWER 42 OF 53 LIFESCI COPYRIGHT 2006 CSA on STN
ACCESSION NUMBER: 83:4719 LIFESCI
TITLE: Role of light intensity and temperature in the regulation of hydrogen photoproduction by the marine cyanobacterium Oscillatoria sp. strain Miami BG7.
AUTHOR: Phlips, E.J.; Mitsui, A.
CORPORATE SOURCE: Sch. Marine & Atmospheric Sci., Univ. Miami, Miami, FL 33149, USA
SOURCE: APPL. ENVIRON. MICROBIOL., (1983) vol. 45, no. 4, pp. 1212-1220.
DOCUMENT TYPE: Journal
FILE SEGMENT: K
LANGUAGE: English
SUMMARY LANGUAGE: English
AB This paper deals with the role of several key environmental parameters in the development and maintenance of hydrogen production activity in the marine blue-green alga (cyanobacterium) Oscillatoria sp. strain Miami BG7. Three main issues are addressed: (i) how do light intensity, temperature, and nutrient concentration affect the production of cellular biomass capable of evolving **hydrogen gas**; (ii) what effects do light intensity and temperature have on the hydrogen production reaction; and (iii) what impact does oxygen have on hydrogen production, and how can it be controlled. These issues are central to the successful development of a biological hydrogen production technology using this blue-green alga.

L3 ANSWER 43 OF 53 BIOTECHDS COPYRIGHT 2006 THE THOMSON CORP. on STN
ACCESSION NUMBER: 2005-24395 BIOTECHDS
TITLE: Generating **hydrogen gas** comprises culturing **algae** (and optionally also anaerobic bacteria) under illuminated conditions in media comprising sulfur, where the **algae** have reduced sulfate permease activity;
hydrogen gas generation via genetically modified green alga
AUTHOR: MELIS A; WINTZ H C
PATENT ASSIGNEE: UNIV CALIFORNIA
PATENT INFO: WO 2005072254 11 Aug 2005
APPLICATION INFO: WO 2005-US1937 21 Jan 2005
PRIORITY INFO: US 2004-762769 21 Jan 2004; US 2004-762769 21 Jan 2004
DOCUMENT TYPE: Patent

LANGUAGE: English
OTHER SOURCE: WPI: 2005-564411 [57]
AN 2005-24395 BIOTECHDS
AB DERWENT ABSTRACT:
NOVELTY - Methods for generating **hydrogen gas** using **algae** with reduced sulfate permease activity, are new. In some of the methods anaerobic bacteria are also used to produce more hydrogen.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for: (1) generating (M1) **hydrogen gas** comprising: (a) culturing **algae** under illumination in a media comprising sulfur, where the **algae** have reduced sulfate permease expression relative to wild-type; (b) sealing the **algae** culture from atmospheric oxygen; and (c) collecting **hydrogen gas** evolved; (2) generating (M2) **hydrogen gas** comprising: (a) subjecting a biomass comprising an **algae** to sunlight in a sulfur-containing media comprising carbon dioxide and inorganic nutrients under conditions that cause the **algae** to undergo oxygenic photosynthesis and to generate **hydrogen gas**; and (b) subjecting an anaerobic photosynthetic bacterium in the media to sunlight under conditions so as to generate hydrogen from a nitrogenase/hydrogenase enzymatic system in the media; (3) generating (M3) **hydrogen gas**, comprising: (a) providing in an aqueous media a genetically modified strain of Chlamydomonas reinhardtii; (b) providing a strain of Rhodobacter sphaeroides photosynthetic bacteria; (c) exposing the media to sunlight under conditions to allow for the generation of biomass and hydrogen; (d) subjecting an anaerobic photosynthetic bacterium in the media to sunlight so as to generate hydrogen from a nitrogenase/hydrogenase enzymatic system in the media; (e) providing a strain of Clostridium in the media; and (f) inducing fermentation of the biomass in the media via Clostridium sp.; (4) generating (M4) hydrogen comprising culturing a combination of sulP1 strain of Chlamydomonas reinhardtii and Rhodobacter sphaeroides with Clostridium sp.; (5) generating (M5) **hydrogen gas**, comprising: (a) providing in an aqueous media a sulP1 strain of Chlamydomonas reinhardtii and Rhodobacter sphaeroides bacteria; and (b) exposing the media to sunlight under conditions that allow the generation of hydrogen; (6) an isolated nucleotide sequence selected from SEQ ID NOs 2-6 (3873, 1984, 1863, 2253, and 1853 bp) and a sequence which hybridizes to any one of them; (7) an isolated amino acid sequence selected from SEQ ID NO:1 (411 amino acids) and a sequence with 90% or more sequence homology to SEQ ID NO:1; (8) a genetically modified **algae** in which the sulfate uptake pathway is downregulated to 50% or less relative to wild-type **algae**; (9) a composition comprising water, **algae** growth nutrients, and the **algae** of (8); (10) an assay for detecting low levels of sulfur uptake in a sample of genetically modified green **algae** comprising: (a) culturing a genetically modified sample of green **algae** in TAP media in lighted, anaerobic conditions; (b) transferring an aliquot of the sample into a media comprising sulfur; (c) culturing the aliquot in lighted conditions; and (d) detecting the level of aryl-sulfatase (ARS) activity in the aliquot, where an elevated level of ARS activity is a positive indicator that the modified **algae** is deficient in sulfur uptake; (11) an isolated antisense oligonucleotide comprising a nucleotide sequence complementary to (codons 118-412 of) SEQ ID NO:2; (12) an expression vector comprising an antisense sequence complementary to codons 118-412 of SEQ ID NO:2; and (13) a composition comprising a sulP strain of Chlamydomonas reinhardtii and a Rhodobacter sphaeroides bacterium that is anaerobic and photosynthetic.

BIOTECHNOLOGY - Preferred Method: In (M1) the **algae** is a green **algae** and comprises a genome which is genetically engineered to reduce sulfate permease expression. The **algae** is a unicellular, photosynthetic, anoxygenic **algae**. The **algae** is chosen from Rhodobacter sphaeroides and genetically modified Chlamydomonas reinhardtii. The **algae** is Rhodobacter sphaeroides an anoxygenic photosynthesis bacterium of lineage Proteobacteria, alphaproteobacteria, Rhodobacterales, Rhodobacteraceae. The **algae** is an isolated strain with a level of sulfate permease of 50% or less of that of wild-type. The **algae** is genetically modified by insertion of an antisense sequence to CrcpSulP. The **algae** is modified by insertion of a sense or antisense

strand of CrcpSulP, ablation of CrcpSulP, and targeted gene deletion of CrcpSulP. The antisense sequence hybridizes to a portion of SEQ ID NO:2. (M5) preferably further comprises providing Clostridium in the media.(M2) preferably further comprises inducing fermentation of the biomass of Chlamydomonas/Rhodobacter via Clostridium sp. Preferred Composition: The composition comprising a sulP1 strain of Chlamydomonas reinhardtii and a Rhodobacter sphaeroides bacterium further comprises a Clostridium sp having the lineage Bacteria, Firmicutes, Clostridia, Clostridales, Clostridiaceae.

USE - The methods are useful for generating **hydrogen gas** (claimed) for use as a fuel.

ADVANTAGE - **Algae** produce **hydrogen gas** in the absence of sulfur in their growth media, but removing sulfur from the growth media is problematic. The methods allow the production of hydrogen using **algae** without requiring the removal of sulfur from the media, and alleviate the need to allow the cells to go back to normal photosynthesis to recover metabolites such as starch and protein, allowing sustained and continuous hydrogen production. The methods including the use of green **algae** and photosynthetic purple bacteria are efficient in using a broad portion of the solar spectrum.(94 pages)

L3 ANSWER 44 OF 53 BIOTECHDS COPYRIGHT 2006 THE THOMSON CORP. on STN
ACCESSION NUMBER: 2002-05053 BIOTECHDS
TITLE: Reversible physiological process for temporal separation of oxygen evolution and hydrogen production in a microorganism, by growing and incubating a culture of the microorganism under illuminated conditions;
Chlamydomonas reinhardtii fermentation and photosynthesis activity
AUTHOR: ANASTASIOS M; ZHANG L; BENEMANN J R; FORESTIER M; GHIRARDI M; SEIBERT M
PATENT ASSIGNEE: ANASTASIOS M; ZHANG L; BENEMANN J R; FORESTIER M; GHIRARDI M; SEIBERT M
PATENT INFO: US 2001053543 20 Dec 2001
APPLICATION INFO: US 1999-748690 28 Dec 1999
PRIORITY INFO: US 2000-748690 22 Dec 2000
DOCUMENT TYPE: Patent
LANGUAGE: Russian
OTHER SOURCE: WPI: 2002-121442 [16]
AN 2002-05053 BIOTECHDS
AB DERWENT ABSTRACT:

NOVELTY - A reversible physiological process (M) for temporal separation of oxygen evolution and hydrogen production in a microorganism (I), involves growing culture of (I) in medium under illuminated conditions to accumulate endogenous substrate, depleting from medium a nutrient such as sulfur, iron and/or manganese, sealing culture from atmospheric oxygen, incubating culture in light, and collecting evolved gas.

DETAILED DESCRIPTION - A reversible physiological process (M) for temporal separation of oxygen evolution and hydrogen production in a microorganism (I), involves growing culture of (I) in medium under illuminated conditions to accumulate endogenous substrate, depleting from medium a nutrient such as sulfur, iron and/or manganese, sealing culture from atmospheric oxygen, incubating culture in light, where a rate of light-induced oxygen production is equal to or less than a rate of respiration and collecting evolved gas.

BIOTECHNOLOGY - Preferred Method: (M) further involves generating hydrogen from water and the accumulated substrate using light and a hydrogenase. The nutrient is depleted from the medium to a concentration of 0.5 mM or less. (M) further comprises replacing a head gas with an inert gas, preferably nitrogen, and after incubating and collecting, repeating the steps of growing to accumulate additional substrate, depleting, sealing and incubating for a number of cycles. (M) further involves providing a medium with the depleted nutrient after generating and repeating the steps of growing, depleting, incubating and generating. (I) is selected from green, red, brown, and blue **algae** such as Chlamydomonas reinhardtii. The substrate is selected from acetate, carbohydrate, lipid and protein.

USE - (M) is useful for the temporal separation of oxygen evolution and hydrogen production in a microorganism (claimed). (M) is useful for

sustained photobiological **hydrogen gas** production in cultures of microorganisms, such as C.reinhardtii.

EXAMPLE - Sustained photobiological production of **hydrogen gas** in Chlamydomonas reinhardtii was as follows. When C.reinhardtii cultures were deprived of inorganic sulfur (less than 100 microM), the light-saturated rates of O2 evolution and CO2 fixation declined significantly within 24 hours in the light, without a proportional loss of chloroplast or thylakoid membrane electron transport components. Analysis indicated that such loss in electron transport activity was due to the conversion of PSII centers from the QB-reducing to QB'-non-reducing form. The activity of photosynthesis, measured from the light-saturated rate of O2 evolution in C.reinhardtii declined biexponentially from 48 mmol O2 (mol Chl)-1 S-1 at t=0 hours to less than 3 mmol O2 (mol Chl)-1 S-1 at t=120 hours. Cellular respiration, measured from the rate of O2 consumption in the dark remained fairly constant at about 13 mmol O2 (mol Chl)-1 S-1 over the 0-70 hour period and declined slightly thereafter. The absolute activity of photosynthesis decreased below the level of respiration in C.reinhardtii after about 24-30 hours of sulfur deprivation. Slower inactivation results were obtained with iron (less than 1.0 microM) or manganese (less than 1.0 microM) deprivation. After about 24-30 hours of sulfur deprivation, a sealed C.reinhardtii culture quickly became anaerobic in the light due to the greater rate of respiration than photosynthesis of the cells. This was confirmed by measurements with a Clark-type O2 electrode. Tests were performed to determine whether the hydrogenase activity of the cells was induced and sustained under these conditions. The results showed that anaerobiosis (but not darkness) was necessary and sufficient for induction of the reversible hydrogenase and for light-induced H2-production activity in C.reinhardtii. (15 pages)

L3 ANSWER 45 OF 53 BIOTECHDS COPYRIGHT 2006 THE THOMSON CORP. on STN
ACCESSION NUMBER: 1984-01287 BIOTECHDS
TITLE: Hydrogen and oxygen production using alga; involves irradiation and cultivation until the alga regain their color and further irradiation
PATENT ASSIGNEE: Greenbaum E
PATENT INFO: US 6388872 2 Aug 1983
APPLICATION INFO: US 1982-388872 16 Jun 1982
PRIORITY INFO: US 1982-388872 16 Jun 1982
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: WPI: 1983-801325 [43]
AN 1984-01287 BIOTECHDS
AB The efficiency of a process for producing **hydrogen gas** by subjecting **algae** to light irradiation is increased by culturing the **algae**, which have been bleached in the 1st period of irradiation, in a culture medium in an aerobic atmosphere until they have regained their color. The **algae** are then subjected to a 2nd period of irradiation, after which hydrogen is produced at an enhanced rate.

L3 ANSWER 46 OF 53 BIOENG COPYRIGHT 2006 CSA on STN
ACCESSION NUMBER: 2004066166 BIOENG
DOCUMENT NUMBER: 635434
TITLES: [Fe]-hydrogenases in green **algae**: Photo-fermentation and hydrogen evolution under sulfur deprivation
AUTHOR: Winkler, Martin; Hemschemeier, Anja; Gotor, Cecilia; Melis, Anastasios; Happe, Thomas
CORPORATE SOURCE: Botanisches Institut Universitat Bonn, 53115 Bonn, Germany
SOURCE: International Journal of Hydrogen Energy. Vol. 27, no. 11-12, pp. 1431-1439. 2002.
Conference: Biohydrogen 2002 (BIO-H2), Ede, Netherlands, 04/21/02
ISSN: 0360-3199
DOCUMENT TYPE: Book; Conference
LANGUAGE: English
AN 2004066166 BIOENG
AB Recent studies indicate that [Fe]-hydrogenases and H sub(2) metabolism

are widely distributed among green **algae**. The enzymes are simple structured and catalyze H sub(2) evolution with similar rates than the more complex [Fe]-hydrogenases from bacteria. Different green algal species developed diverse strategies to survive under sulfur deprivation. Chlamydomonas reinhardtii evolves large quantities of **hydrogen gas** in the absence of sulfur. In a sealed culture of C. reinhardtii, the photosynthetic O sub(2) evolution rate drops below the rate of respiratory O sub(2) consumption due to a reversible inhibition of photosystem II, thus leading to an intracellular anaerobiosis. The algal cells survive under these anaerobic conditions by switching their metabolism to a kind of photo-fermentation. Although possessing a functional [Fe]-hydrogenase gene, the cells of Scenedesmus obliquus produce no significant amounts of H sub(2) under S-depleted conditions. Biochemical analyses indicate that S. obliquus decreases almost the complete metabolic activities while maintaining a low level of respiratory activity.

L3 ANSWER 47 OF 53 BIOENG COPYRIGHT 2006 CSA on STN
ACCESSION NUMBER: 2004066145 BIOENG
DOCUMENT NUMBER: 635413
TITLES: A power-law sensitivity analysis of the hydrogen-producing metabolic pathway in Chlamydomonas reinhardtii
AUTHOR: Horner, Jack K; Wolinsky, Murray A
CORPORATE SOURCE: Los Alamos National Laboratory High Perf. Computing Environments Sci. Appl. International Corporation, Los Alamos, NM 87545, United States
SOURCE: International Journal of Hydrogen Energy. Vol. 27, no. 11-12, pp. 1251-1255. 2002.
Conference: Biohydrogen 2002 (BIO-H2), Ede, Netherlands, 04/21/02
ISSN: 0360-3199
DOCUMENT TYPE: Book; Conference
LANGUAGE: English
AN 2004066145 BIOENG
AB Melis et al. have demonstrated that the green alga Chlamydomonas reinhardtii, when deprived of sulfur, can produce **hydrogen gas** for [similar to]70 h, then can resume **hydrogen gas** production after a brief period of "recharging" in the presence of sulfur. Here we describe an S-system model of H sub(2) production by C. reinhardtii. Through that model we investigate the sensitivity of H sub(2) production to photosynthetic efficiency, and to contention for the protons produced by the photolysis of water, between hydrogen production on the one hand, and ATP consumption by cellular functions outside the H sub(2) production path on the other. The model identifies for experimental investigation several potential systemic constraints on any genetic re-engineering effort aimed at increasing the H sub(2) production efficiency of the alga.

L3 ANSWER 48 OF 53 BIOENG COPYRIGHT 2006 CSA on STN
ACCESSION NUMBER: 2004066133 BIOENG
DOCUMENT NUMBER: 635401
TITLES: Hydrogen in education - A biological approach
AUTHOR: Wunschiers, Robbe; Lindblad, Peter
CORPORATE SOURCE: University of Cologne Institute of Genetics, Koln 50931, Germany
SOURCE: International Journal of Hydrogen Energy. Vol. 27, no. 11-12, pp. 1131-1140. 2002.
Conference: Biohydrogen 2002 (BIO-H2), Ede, Netherlands, 04/21/02
ISSN: 0360-3199
DOCUMENT TYPE: Book; Conference
LANGUAGE: English
AN 2004066133 BIOENG
AB **Hydrogen gas** is regarded as a potential candidate for a future energy economy. The change towards new energy systems with **hydrogen gas** as an energy carrier will have an immense

impact on society. Thus, an integrate part of current research and development must be the inclusion of the new technology into public education. By means of a model bioreactor for light-dependent (photobiological) production of **hydrogen gas** with green **algae**, we try to serve this goal in biological education. Various simple photo-bioreactor types (closed batch, open batch) were analyzed for their capability to produce hydrogen under different conditions. The focus laid on functionality and simplicity rather than on high efficiency. Easy-to-handle systems that can be used in the classroom are presented. In a more sophisticated version a proton exchange membrane (PEM-) fuel cell was connected to a continuous gas flow tube bioreactor. We developed a software interface, designed to read light intensity, temperature and power generation by the bioreactor and the connected fuel cell, respectively. Thus, this bioreactor is specially aimed at integrative teaching in natural science and computer technology at middle and high school level.

L3 ANSWER 49 OF 53 BIOENG COPYRIGHT 2006 CSA on STN
ACCESSION NUMBER: 2004390271 BIOENG
DOCUMENT NUMBER: 4693324
TITLES: Process for selection of oxygen-tolerant algal mutants that produce H sub(2)
AUTHOR: Ghirardi, M; Seibert, M
PATENT INFORMATION: US 5871952 19990216
DOCUMENT TYPE: Patent
LANGUAGE: English
NOTE: US CLASS: 435/34; 435/168; 435/173.1; 435/173.9; 435/244; 435/245; 435/257.1; 435/257.6.
OTHER SOURCE: ASFA Marine Biotechnology Abstracts; ASFA 1: Biological Sciences & Living Resources; ASFA Aquaculture Abstracts
AN 2004390271 BIOENG
AB A process for selection of oxygen-tolerant, H sub(2) -producing algal mutant cells comprising: (a) growing algal cells photoautotrophically under fluorescent light to mid log phase; (b) inducing algal cells grown photoautrophically under fluorescent light to mid log phase in step (a) anaerobically by (1) resuspending the cells in a buffer solution and making said suspension anaerobic with an inert gas; (2) incubating the suspension in the absence of light at ambient temperature; (c) treating the cells from step (b) with metronidazole, sodium azide, and added oxygen to controlled concentrations in the presence of white light. (d) washing off metronidazole and sodium azide to obtain final cell suspension; (e) plating said final cell suspension on a minimal medium and incubating in light at a temperature sufficient to enable colonies to appear; (f) counting the number of colonies to determine the percent of mutant survivors; and (g) testing survivors to identify oxygen-tolerant H sub(2) -producing mutants.

L3 ANSWER 50 OF 53 SCISEARCH COPYRIGHT (c) 2006 The Thomson Corporation on STN
ACCESSION NUMBER: 2002:875073 SCISEARCH
THE GENUINE ARTICLE: 607JG
TITLE: A power-law sensitivity analysis of the hydrogen-producing metabolic pathway in Chlamydomonas reinhardtii
AUTHOR: Horner J K (Reprint); Wolinsky M A
CORPORATE SOURCE: Los Alamos Natl Lab, LANL, CCN-8, MS T080, Los Alamos, NM 87545 USA (Reprint); Los Alamos Natl Lab, LANL, Los Alamos, NM 87545 USA; Los Alamos Natl Lab, LANL, Div Biol Sci, Los Alamos, NM 87545 USA
COUNTRY OF AUTHOR: USA
SOURCE: INTERNATIONAL JOURNAL OF HYDROGEN ENERGY, (NOV-DEC 2002) Vol. 27, No. 11-12, pp. 1251-1255. ISSN: 0360-3199.
PUBLISHER: PERGAMON-ELSEVIER SCIENCE LTD, THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, ENGLAND.
DOCUMENT TYPE: Article; Journal
LANGUAGE: English
REFERENCE COUNT: 8
ENTRY DATE: Entered STN: 15 Nov 2002
Last Updated on STN: 15 Nov 2002

ABSTRACT IS AVAILABLE IN THE ALL AND IALL FORMATS

AB Melis et al. have demonstrated that the green alga Chlamydomonas reinhardtii, when deprived of sulfur, can produce **hydrogen gas** for similar to70 h, then can resume **hydrogen gas** production after a brief period of "recharging" in the presence of sulfur. Here we describe an S-system model of H-2 production by C reinhardtii. Through that model we investigate the sensitivity of H-2 production to photosynthetic efficiency, and to contention for the protons produced by the photolysis of water, between hydrogen production on the one hand, and ATP consumption by cellular functions outside the H-2 production path on the other. The model identifies for experimental investigation several potential systemic constraints on any genetic re-engineering effort aimed at increasing the H-2 production efficiency of the alga. (C) 2002 Published by Elsevier Science Ltd on behalf of the International Association for Hydrogen Energy.

L3 ANSWER 51 OF 53 SCISEARCH COPYRIGHT (c) 2006 The Thomson Corporation on STN

ACCESSION NUMBER: 1996:77454 SCISEARCH
THE GENUINE ARTICLE: TQ946
TITLE: The potential applications of cyanobacterial photosynthesis for clean technologies
AUTHOR: Hall D O (Reprint); Markov S A; Watanabe Y; Rao K K
CORPORATE SOURCE: UNIV LONDON KINGS COLL, DIV LIFE SCI, CAMPDEN HILL RD, LONDON W8 7AH, ENGLAND (Reprint); CENT RES INST ELECT POWER IND, ABIKO RES LAB, ABIKO, CHIBA, JAPAN
COUNTRY OF AUTHOR: ENGLAND; JAPAN
SOURCE: PHOTOSYNTHESIS RESEARCH, (NOV 1995) Vol. 46, No. 1-2, pp. 159-167.
ISSN: 0166-8595.
PUBLISHER: KLUWER ACADEMIC PUBL, VAN GODEWIJCKSTRAAT 30, 3311 GZ DORDRECHT, NETHERLANDS.
DOCUMENT TYPE: Article; Journal
LANGUAGE: English
REFERENCE COUNT: 46
ENTRY DATE: Entered STN: 1996
Last Updated on STN: 1996

ABSTRACT IS AVAILABLE IN THE ALL AND IALL FORMATS

AB Natural photosynthesis may be adapted to advantage in the development of clean energy technologies. Efficient biocatalysts that can be used in solar energy conversion technologies are the cyanobacteria. Photobioreactors incorporating cyanobacteria have been used to demonstrate (a) the production of **hydrogen gas**, (b) the assimilation of CO2 with the production of algal biomass, (c) the excretion of ammonium, and (d) the removal of nitrate and phosphate from contaminated waters.

L3 ANSWER 52 OF 53 SCISEARCH COPYRIGHT (c) 2006 The Thomson Corporation on STN

ACCESSION NUMBER: 1995:35719 SCISEARCH
THE GENUINE ARTICLE: BB85E
TITLE: DEPOSITION OF METALLIC PLATINUM IN BLUE-GREEN-**ALGAE** CELLS
AUTHOR: HITCHENS G D (Reprint); ROGERS T D; MURPHY O J; PATTERSON C O; HEARN R H
CORPORATE SOURCE: LYNNTECH INC, 7610 EASTMARK DR, SUITE 105, COLLEGE STN, TX 77840 (Reprint); TEXAS A&M UNIV, DEPT BIOL, COLLEGE STN, TX 77843
COUNTRY OF AUTHOR: USA
SOURCE: ENZYMATIC CONVERSION OF BIOMASS FOR FUELS PRODUCTION, (1994) Vol. 566, pp. 246-254.
ISSN: 0097-6156.
PUBLISHER: AMER CHEMICAL SOC, 1155 SIXTEENTH ST NW, WASHINGTON, DC 20036.
DOCUMENT TYPE: General Review; Journal
LANGUAGE: English
REFERENCE COUNT: 37
ENTRY DATE: Entered STN: 1995
Last Updated on STN: 1995

ABSTRACT IS AVAILABLE IN THE ALL AND IALL FORMATS

AB A method for placing metallic platinum in contact with the photosynthetic membranes of the unicellular blue green alga or cyanobacterium Anacystis nidulans (Synechococcus sp.) is described. It was found that cells treated in this way were capable of forming **hydrogen gas** when illuminated. The deposited platinum particles acted as a catalyst for the generation of hydrogen from photosynthetic light reactions in the absence of an added exogenous electron transfer agent. This exploratory work indicates that electron transfer can occur directly between the membrane-bound Photosystem I and the Pt particles. Electron micrographs of platinum treated **algae** show deposits of platinum at the surfaces of the internal photosynthetic membranes. The work has long-term implications for the use of cyanobacteria cells for the photoproduction of hydrogen fuel. The innovative aspect of the research has been to demonstrate a technique for placing metallic conductors in direct contact with the membrane structures of microorganisms. This approach can lead, for example, to new types of selective electrochemical biosensors.

L3 ANSWER 53 OF 53 SCISEARCH COPYRIGHT (c) 2006 The Thomson Corporation on STN

ACCESSION NUMBER: 1982:148866 SCISEARCH
THE GENUINE ARTICLE: NF158
TITLE: **HYDROGEN GAS**-PRODUCTION IN EUKARYOTIC **ALGAE**
AUTHOR: BRAND J J
CORPORATE SOURCE: UNIV TEXAS, DEPT BOT, AUSTIN, TX 78712
COUNTRY OF AUTHOR: USA
SOURCE: JOURNAL OF THE ELECTROCHEMICAL SOCIETY, (1982) Vol. 129, No. 3, pp. C113-C113.
ISSN: 0013-4651.
PUBLISHER: ELECTROCHEMICAL SOC INC, 10 SOUTH MAIN STREET, PENNINGTON, NJ 08534.
DOCUMENT TYPE: Conference; Journal
FILE SEGMENT: PHYS; ENGI
LANGUAGE: English
REFERENCE COUNT: 0
ENTRY DATE: Entered STN: 1994
Last Updated on STN: 1994

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